NASA TECHNICAL MEMORANDUM



NASTRAN THERMAL ANALYZER THEORY AND APPLICATION INCLUDING
A GUIDE TO MODELING ENGINEERING PROBLEMS
Volume II

Clifton E. Jackson, Jr.

Goddard Space Flight Center

Greenbelt, Md. 20771

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General heat-transfer computer

program, Finite element method,

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NASTRAN THERMAL ANALYZER THEORY AND APPLICATION INCLUDING A GUIDE TO MODELING ENGINEERING PROBLEMS

Clifton E. Jackson, Jr.

I. INTRODUCTION

The purpose of this Sample Problem Library, in conjunction with Volume I of the NASTRAN Thermal Analyzer ($\overline{N}TA$) Manual, $\overline{1,2}$ is to demonstrate by example the flexibility and inherent simplicity which characterizes $\overline{N}TA$ modeling.

In order to avoid unnecessary complexity, one basic sample problem is developed in both Linear Steady-State, Nonlinear Steady-State, and Transient formulations as Problems 1, 2, and 3, respectively. Seventeen subsequent problems are used to demonstrate specific modifications which can be made to model certain types of thermal couplings and/or modify the input and/or output required or produced by the program (Problems 12 and 19 vary from this philosophy, as will be noted). All of the changes made from a previous problem are documented at the end of each Bulk Data Deck, clearly indicating the new card or cards which were required to produce the desired modification and allowing the user to understand the level of effort involved.

The first problem will be discussed in detail on a card-by-card basis in order to delineate the basic structure of a $\overline{\text{NTA}}$ problem, while Problems 2 through 20, which are primarily variants of Problem 1, will be reviewed so as to point out the changes which were made from a previous problem, the purpose of the alteration, and the resultant modification in the output.

Duplication of the data presented in Volume I of the \overline{NTA} manual and in the standard NASTRAN User's Manual³ will be kept to a minimum, and references to relevant material in them will be supplied as necessary.

Appendices will contain the actual NTA sample problem outputs, and in addition will provide compilations of different types of information useful both to readers of this guide and to NASTRAN thermal analysts in general. It is recommended that these appendices be read thoroughly, especially A, B, and C, as it is felt that the effective use of this manual and the NTA will thereby be made considerably easier.

II. EXPLICATION OF THE NTA SAMPLE PROBLEMS

A. Physical Description of the Basic Problem

The physical situation chosen for modeling in these sample problems is a space radiating fin supported by rods and extending from a pipe in which a fixed temperature coolant is flowing, as is shown in figure 1. This configuration was chosen because it is easily grasped from a physical standpoint, yet is complex enough to allow a variety of thermal effects, such as convection, radiation, anisotropic heat conductivity, etc., to be meaningfully applied while the temperature distribution in the fin, and other thermal quantities, are being computed. The exact parameters and dimensions chosen are:

Constant Fluid Temperature in the Radiator Pipe: 300°C

Fin Material: Aluminum

Effective Convective Area from fluid to pipe: 0.0314 m² (pipe surface area along 0.1 m

fin dimension)

Convective Film Coefficient from fluid to pipe: $200 \text{ W/m}^2 - {}^{\circ}\text{C}$

Cross-Sectional Area of Support Rod: 0.001 m²

Thickness of Radiating Fin: 0.01 m

Length and Width of Radiating Fin: 0.3 m and 0.1 m, respectively

External Thermal Input to Radiating Fin: 48 W (applied by a uniformly absorbed flux)

Emissivity of Radiating Fin (both top and bottom surfaces): 0.9 View Factors of Radiating Fin to Space (top and bottom): 1.0

Units used: meters, watts, degrees Celsius

B. Generation of the Linear Steady-State (LSS) Finite-Element Model*

1. GRID Points

In creating a finite-element model of the radiating fin problem described above, it is first necessary to select the locations where temperature solutions are desired and to identify them by creating a <u>GRID</u> point for each one. The location of the origin is arbitrary, and <u>GRID</u> points will usually be located at intervals around the boundary and on the surface of a 2-D structure (or internally to a 3-D structure). Their frequency, in general, varies directly with the nonlinearity of the proximate thermal gradients. For example, if a rod were being modeled with a fixed temperature at one end and a constant rate of heat loss at the other end, one <u>GRID</u> point at each end would be sufficient to model the linear gradient involved. However, if the bar were allowed to radiate energy along its length, the resulting nonlinear gradient down the rod might require 3 or more <u>GRID</u> points for accurate results to be obtained. There are no hard and fast rules which prescribe the number of <u>GRID</u> points that an analyst should use in any given situation, but the analyst should always be wary of areas in a model where large changes in temperature are exhibited between adjacent GRID

^{*}In the remainder of the text, when names of actual NASTRAN cards are used, they will be capitalized and underlined.

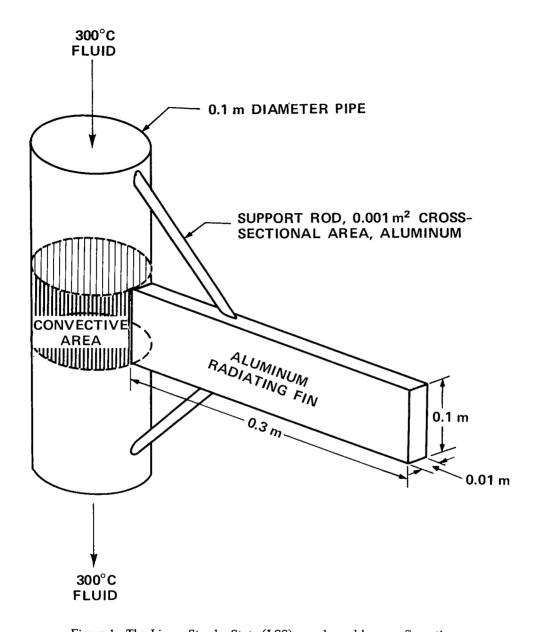


Figure 1. The Linear Steady-State (LSS) sample problem configuration.

points and be ready to add additional <u>GRID</u> points should convergence be slow in a non-linear steady-state (NLSS) run or if thermal oscillations occur during a transient run. The GRID points selected for this sample problem are shown in figure 2.

2. Heat Conduction Elements

Once the <u>GRID</u> point locations have been selected, it is necessary to use connection cards to form heat conduction elements which in conjunction with property cards and material cards, specify the conductive couplings between the <u>GRID</u> points.

Each connection card begins with the letter "C" and joins selected <u>GRID</u> points together to form a heat conduction element. All of these elements taken together are assembled into a matrix which specifies the conductive coupling between each <u>GRID</u> point in the model. For example, considering figure 2, if it is desired to connect the <u>GRID</u> points together to form three 2-D plates (elements 30, 40, and 50) and two 1-D rods (elements 10 and 20), <u>CQUAD2</u> and <u>CROD</u> cards could be used as in figure 3 and the pictured plates and rods would be created (this is analogous to a "connect-the-dots" procedure). For most connection cards,

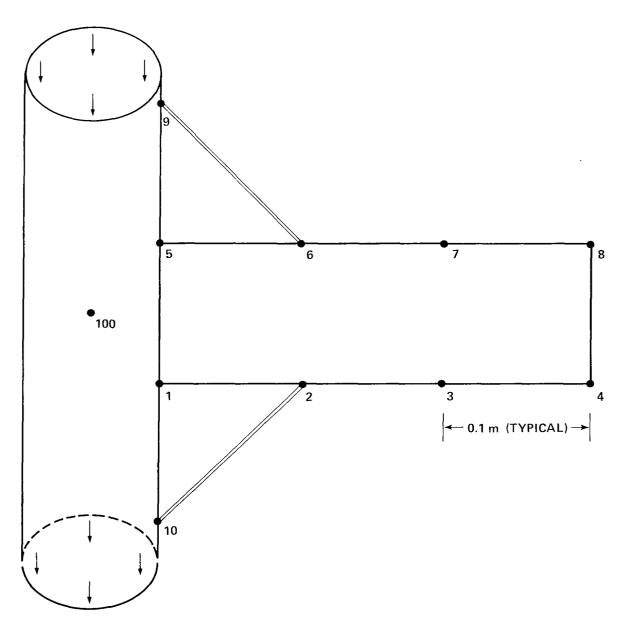


Figure 2. The LSS sample problem configuration with the GRID point locations designated.

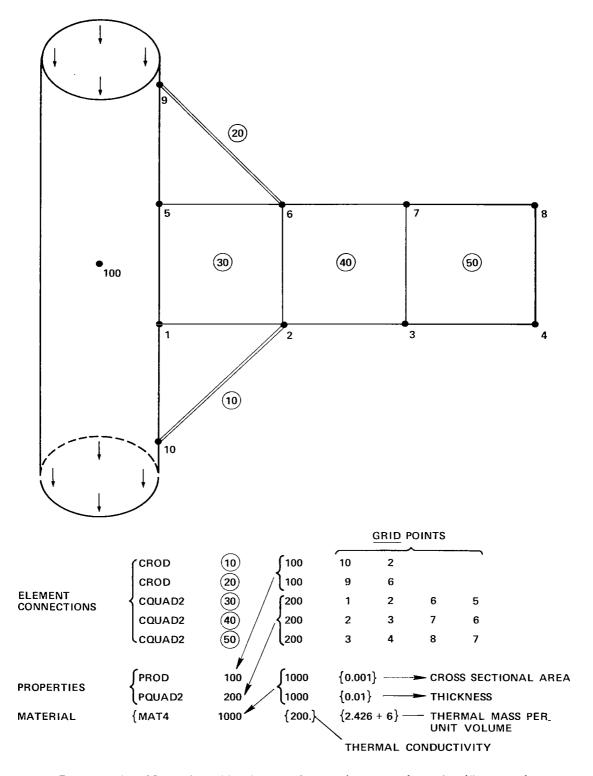


Figure 3. The LSS sample problem heat conduction elements and associated input cards.

it would also be necessary to reference a property card (all of which begin with the letter "P"), which would specify a thickness or cross-sectional area which applied to the referencing element, while in turn referencing a material card (all of which begin with the letter "M") which must be supplied to specify the relevant material properties, such as the thermal conductivity, for the element being defined. In figure 3, for example, the CQUAD2 cards reference a PQUAD2 card which in turn references a MAT4 card (the PQUAD2 card and the MAT4 card may be referenced any number of times by other CQUAD2 or PQUAD2 cards). A list of the heat conduction elements available for conductive heat transfer applications and a brief description of their capabilities and requirements are available in section 3.5.1(2) of Volume I of the NTA Manual.

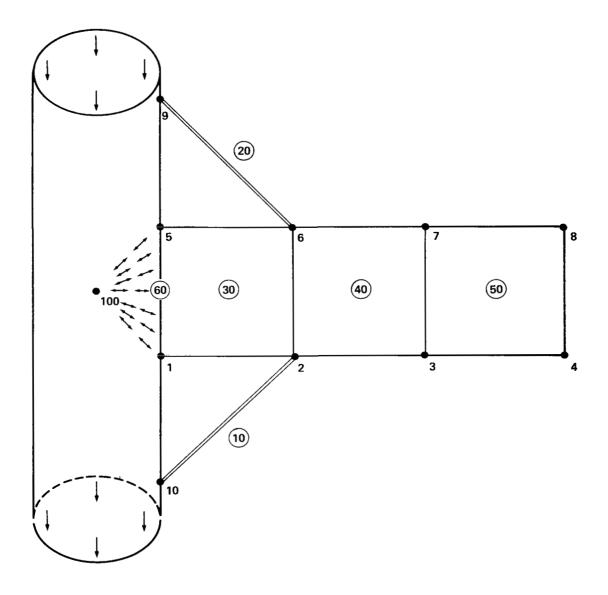
3. Boundary Surface Elements

Boundary surface elements are used to describe surface properties, such as convection or radiation, which must be modeled by the NTA. All elements in NASTRAN are formed by connection cards, and the boundary surface elements are created by the use of the CHBDY card. It should be noted that the mnemonic CHBDY does not imply any geometric shape, as does, for example, CQUAD2 or CTRIA2; the CHBDY card may be used to represent circular, rectangular, triangular, arbitrary quadrilateral, elliptic cylindrical or general surface of revolution boundary configurations, as is discussed in section 3.5.1(3) of Volume I of the NTA Manual. Figure 4 shows the location of the convective coupling between the fluid and the radiating fin, as defined by the CHBDY card and its associated PHBDY and MAT4 cards. The logic involved in this specification is perhaps the most complex in the $\overline{\text{NTA}}$, but verbally stated, what these cards define is a convective coupling of 200 W/ m² - °C between a rectangle 0.314 m wide extending from GRID point 1 to GRID point 5, and a fluid with a temperature corresponding to that of GRID point 100. The second card is a continuation of the CHBDY card, and field 3 of the CHBDY card references field 2 of the PHBDY card, and field 3 of the PHBDY card references field 2 of the MAT4 card. A PHBDY card and a MAT4 card must be referenced if a convective boundary condition is to be simulated. It may be seen that a MAT4 card referenced by a PHBDY card will define a different thermal parameter than a MAT4 card referenced by any other property cards associated with heat conduction elements (i.e., a convective film coefficient will be defined instead of a thermal conductivity).

4. Constraints

Two thermal constraints now need to be applied to complete the conductive/convective finite element model of the sample problem:

a. <u>GRID</u> point 100, the fluid point, must be fixed at 300°C with the use of an <u>SPC</u> (single point constraint) card, and



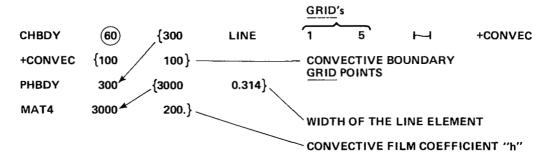


Figure 4. The LSS sample problem convective boundary and associated input cards.

b. <u>GRID</u> points 9 and 10 will be specified to have temperatures equal to those of <u>GRID</u> points 5 and 1, respectively, as designated by the use of two <u>MPC</u> (multipoint constraint) cards.* This action is arbitrary and is done simply to demonstrate the MPC capability.

Figure 5 indicates where the <u>MPC</u> and <u>SPC</u> cards affect the model and lists the input cards involved. Details on <u>MPC</u> and <u>SPC</u> card definition may be found in section 3.5.1(4) of the associated NTA Manual.

5. Loads

In section II. A. of this guide it was stated that 48 watts were to be input to this radiating fin in the form of a uniformly absorbed flux. <u>SLOAD</u> cards, the simplest type of loading cards, were chosen for this example, and powers (in watts) were input to the <u>GRID</u> points as indicated in figure 6 by the <u>SLOAD</u> cards listed there. Figure 7 illustrates the reason for the apparently irregular manner in which the absorbed energy is applied to each <u>GRID</u> point. This phenomenon results from the fact that in determining the energy distribution, energy absorbed by the surface of an element equally proximate to two or more <u>GRID</u> points is divided equally between the competing <u>GRID</u> points, causing <u>GRID</u> points at the corners of an impinging flux to receive a smaller net applied load than points on the sides or at the center.

This concludes the initial description of the linear steady-state formulation of the basic sample problem which will be used to illustrate the $\overline{N}TA$ solution capabilities. As modifications are made to this problem, they will be defined and explained, but repetition of this basic problem and the $\overline{N}TA$ concepts involved in its solution will not be continued after the discussion of sample problem 1.

C. Discussion of the Sample Problems

As described in Volume I of the NTA Manual, section 3.2, every NTA problem is divided into three consecutively ordered segments, the Executive Deck, the Case Control Deck, and the Bulk Data Deck. In the following problem, reviews of each of these sections will be made separately, preceded by a statement of the intent of the problem and followed by a guide describing the output produced. Card types which are required in all runs will be double underlined, and repetition of card descriptions will be minimized by referencing problems to similar problems which have been previously discussed. The listings of the output associated with each sample problem may be found in appendix F.

In addition, a special feature that the user should remember when examining a Case Control Deck is that the $\overline{N}TA$ will check only the first four characters directly after and including the first non-blank character, if unique, to determine the card type. This would mean, for

^{*}This is known as "equivalencing," and if the constrained <u>GRID</u> point has any kind of nonlinear load attached to it, it is the only type of MPC which may be used. See appendix C.

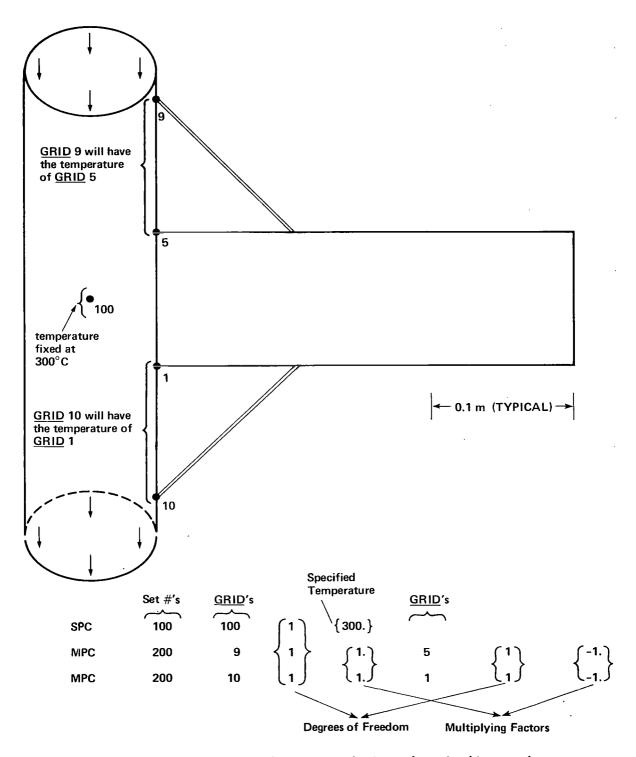
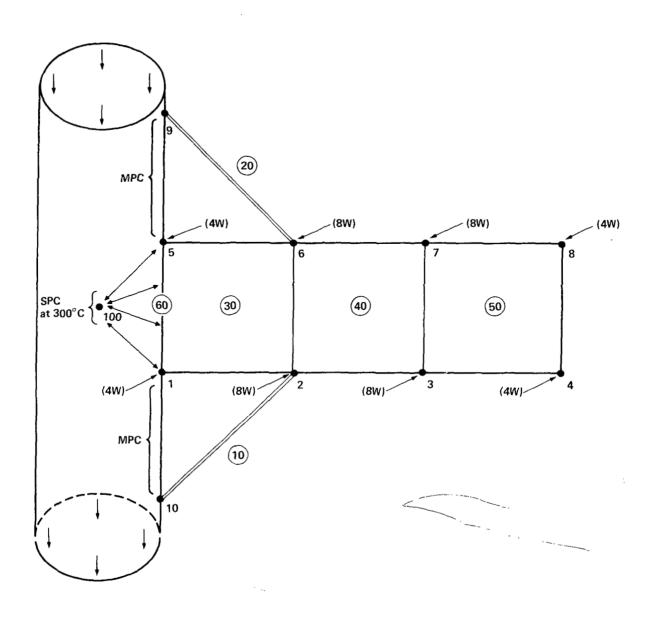
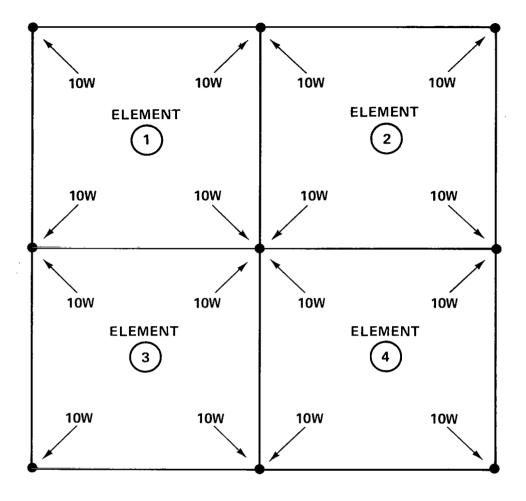


Figure 5. The LSS sample problem constrained points and associated input cards.



		GRID's	POWER (WATTS)	GRID's	POWER (WATTS)
CLOAD	200	~			
SLOAD	300	1	4.	2	8.
SLOAD	300	3	8.	4	4.
SLOAD	300	5	4.	6	8.
SLOAD	300	7	8.	8	4.

Figure 6. The LSS sample problem applied loads and associated input cards. (Also summarizes the entire LSS analytical model)



Each element has an area of $1\,\text{m}^2$, and absorbs $40\,\text{W/m}^2$. The absorbed energy is distributed to each <u>GRID</u> point composing an element based on its share of the element's area, which in this case means an equal distribution. Note that the center <u>GRID</u> point receives twice the energy of a side <u>GRID</u> point, which in turn receives twice the energy of a corner <u>GRID</u> point.

Figure 7. Sample distribution of a uniform absorbed flux to eligible GRID points.

example, that $\underline{SPCFORCES} = \underline{ALL}$ would have the same effect as an $\underline{SPCF} = \underline{ALL}$ request, a fact that would not at first be obvious. It should also be noted that in all \overline{NTA} decks BCD and EBCDIC characters may be used interchangeably for runs made on IBM machines, which means that "+", "=", "(", and ")" may be interchanged with "&", "#", "%", and "<", respectively. This is not true for the CDC and UNIVAC versions of \overline{NTA} , which require BCD code.

1. Sample Problem 1

- a. Intent: This problem demonstrates the linear steady-state (LSS) solution of the basic sample problem described in sections II.A. and II.B.
- b. Executive Control: The function of the Executive Control Deck is to define certain relatively problem-independent variables, which are required by NTA before execution may begin. The format of all cards in this section is free-field, meaning that there are no column restrictions for data entry, though input must start in column 1. Figure 8 displays the Executive Control Deck as used in Problem 1. The purpose of each card is as follows (see Volume I of the NTA Manual, section 3.3, for further details):
 - i) The <u>\$</u> cards are comment cards and are used to explain cards which follow them
 - ii) The <u>ID</u> card provides information that will be used to label a restart tape if one is requested.
 - iii) This <u>TIME</u> card indicates that a maximum of 10 cpu minutes may be consumed before the NTA will terminate execution.
 - iv) This <u>APP</u> (abbreviation for "<u>APP</u>roach") card indicates a heat transfer problem is to be solved.
 - v) This <u>SOL</u> (abbreviation for "<u>SOL</u>ution") card indicates that a linear steady-state (LSS) solution is desired.
 - vi) The CEND card terminates the Executive Control Deck.
- c. Case Control: The function of the Case Control Deck, which also employs a free-field format, is to select from the Bulk Data the input sets desired for this execution and to define the types and format of the output to be produced. The concept of "sets" as used in the NTA is quite simple and is best explained by example. Assume that you had defined several SPC cards in a Bulk Data Deck, some with a set ID 100 in field 2, and some with a 200 in field 2. Those with the 100 would be referred to as SPC set 100, and would be used in the problem solution only if a card saying SPC = 100 appeared in the Case Control Deck. The SPC set 200 cards would be treated as if they did not appear in the problem. Figure 9 displays the Case Control Deck as used in Problem 1, and the general purpose of each card is as follows (see Volume I of the NTA Manual, section 3.4, for further details):
 - i) The <u>TITLE</u> card is used to specify a heading which will appear at the top left of each page of output (the default is all blanks).
 - ii) The <u>LINE</u> card is used to specify the number of lines of data, not including headings, which will appear on each page (the default is 50).

NASTRAN EXECUTIVE CONTROL DECK ECHO

Figure 8. LSS Executive Control Deck from sample problem 1.

```
CARD
COUNT
1
    2
3
    TITLE = LINEAR STEADY-STATE PROBLEM
 8
    $ SPECIFY 51 LINES OF DATA PER PAGE (DOES NOT INCLUDE HEADINGS AT TOP OF PAGE)
 9
10
    LINE = 51
11
12
    $ REQUEST SORTED AND UNSORTED OUTPUT
13
    $ IF THIS CARD IS OMITTED, ONLY THE SORTED BULK DATA WILL APPEAR
14
15
    ECHO = BOTH
16
17
    $ SELECT THE SPC. MPC, AND LOAD SETS TO BE USED IN THIS SOLUTION
18
    SPC = 100
19
20
    MPC = 200
21
    LOAD = 300
22
23
    $ SELECT THE OUTPUT DESIRED (TEMPERATURES, LOADS, AND CONSTRAINT POWERS)
24
25
    OUTPUT
26
    THERMAL=ALL
27
    OLOAD=ALL
28
    SPCF≃ALL
29
    30
31
    32
33
34
    BEGIN BULK
```

Figure 9. LSS Case Control Deck from sample problem 1.

- iii) The <u>ECHO</u> card is used to specify whether only the sorted Bulk Data listing, only the unsorted Bulk Data listing, or both sorted and unsorted Bulk Data listings should be printed (the default is to print the sorted Bulk Data only).
- iv) The <u>SPC</u> card is used to specify the identification number for a set of single-point constraints which is present in the Bulk Data. The constraints will then be used to identify certain <u>GRID</u> points which are to be held at fixed temperatures.
- v) The MPC card is used to specify the identification number for a set of multi-point constraints which is present in the Bulk Data. The constraints will then be used to identify certain GRID points whose temperatures are to be maintained in a fixed relationship during the problem solution.
- vi) The <u>LOAD</u> card is used to specify the identification number for a set of load cards which is present in the Bulk Data. These load cards will specify powers and/or fluxes which are to be applied to the model during the problem solution.
- vii) The <u>OUTPUT</u> card is used to separate the section of the Case Control which specifies boundary conditions and applied loads from the section of the Case Control which specifies the type of output which is desired.
- viii) The <u>THERMAL</u> card is used to request a printout of the <u>GRID</u> point temperatures.
- ix) The <u>OLOAD</u> card is used to request a printout of the linear <u>GRID</u> point applied loads.
- x) The <u>SPCF</u> card is used to request a printout of the power required to sustain each single-point constrained <u>GRID</u> point at its specified temperature.
- xi) The <u>BEGIN BULK</u> card indicates that the Case Control Deck is complete, and that all following cards will be Bulk Data.
- d. Bulk Data: The purpose of the Bulk Data Deck, as displayed in unsorted form in figure 10, is to provide the finite-element description of the problem to be solved. All of the cards presented here have been discussed in some detail in section II.B. of this guide, and the following segment will essentially summarize the information presented there (see Volume I of the NTA Manual, section 3.5, for further details on the formatting and use of these cards).
 - i) The physical units employed must be consistent, but are otherwise completely arbitrary. The units which will be used in this sample problem, as indicated in the initial comment cards, are meters, watts, and degrees Celsius.

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\$ \$ UNITS M	UST BE C	ONSIST	ENT												
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S															
S DEFINE	GRID POI	NTS													
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GRID	2		.1		0.	0.									
GRID	3		.2		0.	0.									
GRID	4		.3		0.	0.									
GRID	5		0.		.1	0.									
GRID	6		.1		.1	0.									
GRID GRID	7 8		.2		.1 .1	O. O.									
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S CONNEC	T GRID P	OINTS													
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CROD	10	100	10		2										
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CQUAD2	40	200	2		3	7		6							
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s															
PROD	100	100		1											
PQUAD2	200	100	.01												
S S DEFINE I	AATERIA	THEO	MAL CON	OHOTE	MTV										
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MAT4	1000	200												ΑŁ	UMI
s															
S DEFINE (CONVECT	IVE AR	EA AND (ONVE	CTIVE	COEFFIC	CIENT	'H'							
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+CONVEC PHBDY	100	100 3000	.31												
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SPC	100	100	1		300										
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SLOAD	300	1	4.		2	8,									
SLOAD	300	3	8,		4	4.									
LOAD	300	5	4.		6	8.									
SLOAD	300	7	8.		8	4.									
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NDDATA															

Figure 10. LSS unsorted Bulk Data Deck from sample problem 1.

ii) The <u>GRID</u> cards are used to define the location of the solution points in the model. Each <u>GRID</u> point is given a unique identifying number along with x, y, and z coordinates* which fix its location in space. These <u>GRID</u> points will be joined together by <u>NTA</u> element connection cards to actually form the model. Often, when a <u>GRID</u> point is being referenced, the <u>NTA</u> requires that a degree-of-freedom be specified. The user should always specify "1". <u>SCALAR</u> and <u>EXTRA</u> points also exist, but are error prone in the <u>NTA</u>, of relatively little use, and will not be discussed here.

^{*}It is possible to use cylidrical or spherical coordinates also-see Volume I of the $\overline{N}TA$ Manual, section 3.5.1(i).

- iii) The <u>CROD</u> cards are a type of element connection card and are used to indicate that two <u>GRID</u> points are to be physically joined together by a thermally conducting rod. The properties of this rod, namely its cross-sectional area and its material composition will be defined respectively by NTA property and material cards.
- iv) The CQUAD2 cards are an additional type of element connection card and are used to indicate that four different GRID points are to be physically joined together by a quadrilateral plate, with one GRID point being located at each corner. The properties of this plate, namely its thickness and its material composition, will be defined respectively by NTA property and material cards.
- v) The <u>PROD</u> card is a type of property card and is used to define the cross-sectional area of the rods defined by the <u>CROD</u> cards which reference it. The material of which the rods are composed will be defined by a material card.
- vi) The <u>PQUAD2</u> card is a type of property card and is used to define the thickness of the quadrilateral plates defined by the <u>CQUAD2</u> cards which reference it. The material of which the plates are composed will be defined by a material card.
- vii) The MAT4 cards are a type of material card and are used to define the thermal conductivity of the material which composes any element connection cards which reference them through any property cards (i.e., CROD cards reference a PROD card which references a MAT4 card).
- viii) The <u>CHBDY</u> card is a type of connection card and is used to define a surface area which will be participating in the thermal system either by transferring heat to other surface areas by convection and/or radiation, or by absorbing external thermal fluxes. This is the most complex of the commonly employed thermal connection card types and is discussed in detail in section 3.5.1(3) of Volume I of the NTA Manual.
- ix) The PHBDY card is a type of property card and is used to specify the area (if necessary), emissivity (if necessary), absorbtivity (if necessary), and number of the material card which contains the convective film coefficient (if necessary). This is the most complex of the commonly employed thermal property card types, and is discussed in detail in section 3.5.1(3) of Volume I of the NTA Manual.
- x) The MAT4 cards (see vii also) are a type of material card which, when referenced by a PHBDY card, will specify the convective film coefficient "h" (W/m²-°C in this problem) which is to be used in calculating the heat exchange between the CHBDY card referencing the PHBDY card in question and the ambient points specified on the continuation portion of the CHBDY card itself.

- xi) The <u>SPC</u> card is a type of constraint card which indicates that a selected <u>GRID</u> point is to remain at a specified temperature during the problem solution.
- xii) The MPC cards are a type of constraint card which indicate that selected GRID points are to maintain a specified temperature relationship to other selected GRID points.
- xiii) The <u>SLOAD</u> cards are a type of loading card which are used to apply fixed loads to selected <u>GRID</u> points.
- xiv) The <u>ENDDATA</u> card indicates that the Bulk Data Deck is complete. Any input cards following an <u>ENDDATA</u> card (assuming that the <u>ENDDATA</u> card is in the Bulk Data) will be ignored.
- e. Output Produced: Output for each of the 20 NTA Sample Problems may be found in appendix F. "User Information" and "User Warning" messages which appear in the output from the sample problems will not be discussed individually, but a description of them may be found in appendix B. All other output data following the Bulk Data listings will be discussed on a page-by-page basis (the page number is found in the upper right hand corner of most computer printout pages), with a minimum of repetition from previous problems. During all further discussions of the sample problems the reader will have to refer to appendix F to see the Executive Control, Case Control, and Bulk Data decks which are being discussed in addition to finding the output produced.

Page No. Description

- The output labeled "TEMPERATURE VECTOR" consists of a <u>GRID</u>-point-by-<u>GRID</u>-point listing of the solution temperatures for all of the <u>GRID</u> points in the model. Each row of output contains up to six temperatures, with the <u>GRID</u> point number of the first temperature in the row being specified at the far left of the row and the following <u>GRID</u> point numbers in each row increasing successively by a value of one (for example, <u>GRID</u> point eight has a temperature of 331.9°C). This output is produced by the "THERMAL=ALL" request in the Case Control Deck.
- The output labeled "LOAD VECTOR" consists of a GRID-point-by-GRID-point listing of the loads applied to all of the GRID points in the model (with the exception that net loads of zero are not included). The correlation of applied loads with GRID point numbers is the same as has been described for the "TEMPERATURE VECTOR," and this "LOAD VECTOR" is produced by the "OLOAD=ALL" request in the Case Control Deck.

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Description

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The output labeled "FORCES OF SINGLE-POINT CONSTRAINT" consists of a <u>GRID</u>-point-by-<u>GRID</u>-point listing of the non-zero thermal loads required to maintain the single-point constrained <u>GRID</u> points at their specified temperatures. The correlation of these internally determined thermal loads with <u>GRID</u> point numbers is the same as has been described for the "TEMPERATURE" and "LOAD" vectors, and these single-point constraint forces are requested by the "SPCF=ALL" request in the Case Control Deck.

unnumbered – first page after the "FORCES OF SINGLE POINT CON-STRAINT" output This section of output is unlabeled, and is produced automatically for all NTA runs which have enabled Fortran output unit 4 (see your local NASTRAN systems programmer for further information). Several useful pieces of information are supplied in this "Run Log:"

- 1) On line one, the NTA computer core load point is defined;
- 2) On line two, the number of CPU and I/O seconds remaining to be used after the completion of the program load are given;
- On most of the following lines, the total CPU seconds consumed, the total wall-clock seconds consumed, and the module presently being executed are listed;
- 4) At the end of each "LINK," generally a group of modules which perform a certain function, the total consumed I/O time is listed, and on the following line the amount of allocated core space which was not used by the preceding LINK is defined;
- 5) At the end of the "Run Log," the amount of core which was never used during the execution is listed.

Obviously, this output would be useful in tuning a problem so that the minimum amount of required resources (time and core) could be requested. Also, in the case of an abend, it provides a trace up to the module where execution ceased. Further information may be requested to appear in the "Run Log" via the use of <u>DIAG</u> cards in the Executive Control, as is described in section 3.3 of Volume I of the NTA Manual.

2. Sample Problem 2*

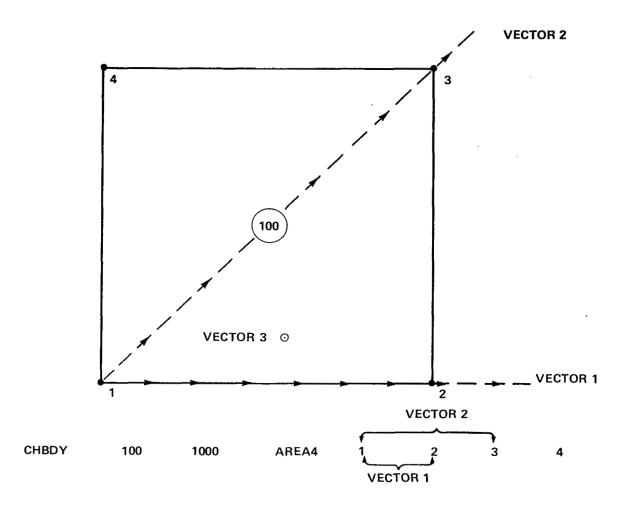
a. Intent: This problem, which is based on Problem 1, adds radiative heat dissipation from the fin to space. The use of the nonlinear steady-state (NLSS) solution algorithm is therefore required and is demonstrated.

^{*}During the discussions of the remaining problems it will be assumed that the reader realizes that more detailed descriptions of input cards may be found in the NTA Manual.

- b. Executive Control: Only minor changes were made from Problem 1:
 - i) The <u>ID</u> card information was updated (changes to this card will be made in each new sample problem, but no further discussion of it will be made).
 - ii) The <u>SOL</u> card was changed to request algorithm 3, which is the nonlinear steady-state solution method.
 - iii) A <u>DIAG</u> 18 card has been included to force the convergence criteria to be printed out after each iteration.
- c. Case Control: Only two changes were made from Problem 1:
 - i) The <u>TITLE</u> card was updated (further changes to this card, which will occur in each new problem, will not be discussed).
 - ii) The TEMP (MATERIAL) card is required for NLSS runs, and is used to reference a set of TEMP and/or TEMPD cards in the Bulk Data which define the estimated final steady-state temperature vector of the problem being solved. In order to avoid divergence, it is important that this guess vector be at least 80 percent of the true absolute steady-state temperature for each GRID point, though it should be realized that grossly high temperature guesses will drastically slow convergence. A tactic which has been successfully used in a variety of situations has been to obtain an initial solution while using a high temperature estimate, and then input this solution (which may be automatically punched as TEMP cards by the NTA—see Problem 11) as the temperature guess vector in a subsequent run.
- d. Bulk Data: All of the changes to the Bulk Data Deck which were made between Problems 1 and 2 are listed at the end of the unsorted Bulk Data echo.* Several new types of cards are seen there, and their uses are as follows:
 - i) The <u>SPC1</u> card is the type of single-point constraint card which should be used in NLSS problems.** It differs from the <u>SPC</u> card used in Problem 1 (which has been removed for Problem 2) in that no temperatures are actually specified on the SPC1 card, and only the ID numbers of the <u>GRID</u> points which are to be held at the temperatures specified for them by the <u>TEMP(MATERIAL)</u> set selected in the Case Control are entered.
 - ii) The <u>CHBDY</u> cards are used to define the radiating boundary elements which cover both sides of the fin. It should be noted that <u>CHBDY</u> cards 200 and 500, 300 and 600, and 400 and 700 are identical except for a reversal in the ordering of the GRID points. As is shown in figure 11, this reversal changes

^{*}This will be true for all of the problems except 12 and 19, in that a previous problem will be referenced and all Bulk Data changes will be listed at the end of the unsorted Bulk Data echo.

^{**}Use of the <u>SPC</u> card has been known to produce incorrect answers; in addition, the <u>TEMP(MATERIAL)</u> set will override any temperatures specified on an SPC card.



VECTOR 1 (X) VECTOR 2 = VECTOR 3, whose direction defines the active side of the <u>CHBDY</u> element. In this case, it is the side facing the reader.

Figure 11. The right-hand rule as applied to a NTA CHBDY AREA4 card.

the orientation of the normal vector formed by the cross-product of the lines between <u>GRID</u> points one and two and <u>GRID</u> points one and three (generally known as the "right-hand rule" vector). The direction of this normal is used in the NTA only when a thermal flux vector from a <u>QVECT</u> card is being applied, though, as Problem 12 will illustrate, a special view factor determination program, VIEW, exists which also makes use of this orientation vector. Therefore, even though it will make no difference in most NTA executions, it is good form to order the <u>CHBDY GRID</u> points such that the cross-product orientation vector will point in the direction in

- which the radiating surface is supposed to be looking. Defining the orientation vector for <u>CHBDY</u> POINT and LINE elements, where this cross-product is not available, is discussed on the <u>CHBDY</u> card Bulk Data description found in section 3.5.3 of Volume I of the NTA Manual.
- iii) The <u>PHBDY</u> card, which is referenced by the six preceding <u>CHBDY</u> cards, defines the emissivity of these radiating surfaces as 0.90.
- iv) The <u>TEMP</u> card, which has been selected for use by the <u>TEMP(MATERIAL)</u> card in the Case Control, defines a temperature guess of 300 degrees for <u>GRID</u> point 100. Whether this value is Celsius or Kelvin cannot be determined until the PARAM cards are examined.
- v) The <u>TEMPD</u> card, which has also been selected for use by the <u>TEMP-(MATERIAL)</u> card in the Case Control, indicates that all <u>GRID</u> points which are not specifically supplied with temperature guesses via <u>TEMP</u> cards will have temperature guesses of 300 degrees. It should be noted that since both the <u>TEMP</u> and <u>TEMPD</u> cards specify the same temperature, the <u>TEMP</u> card could be omitted in this case without affecting the problem in any way.
- vi) The PARAM TABS (Temperature ABSolute) card specifies a value (default= 0.0) which will be added to the temperature guesses and intermediate thermal solution vectors before the calculation of nonlinear loads due to radiation is made. In this case, if the Celsius/Kelvin system has been used in defining other material properties, the TABS value of 273.15 would indicate that the temperature guess vector and the results are and will be in degrees Celsius (the 273.15 value would be added to the temperatures guessed to convert them to the absolute Kelvin scale).
- vii) The PARAM SIGMA card specifies the Stefan-Boltzmann constant (default=0.0) in the units which are being used in the particular problem being solved. In most NTA versions the omission of this card will result in no radiative interchange being included in the problem solution, and the user should verify the presence of this card to assure himself that his results do in fact include nonlinear radiative effects.
- viii) The <u>PARAM MAXIT</u> (<u>MAXimum IT</u>erations) card specifies the maximum number of solution iterations (default=4) which will be allowed before execution will be automatically terminated.
- ix) The <u>PARAM</u> EPSHT (<u>EPS</u>ilon <u>Heat Transfer</u>) card specifies a value (default= 0.001) which will be used in determining whether the desired degree of convergence has been achieved, which would permit the solution iterations

to cease without having reached the MAXIT value. The convergence criteria which are used are discussed in subsection e), where the output for this problem is examined.

- x) The <u>RADLST</u> card is used to indicate which <u>CHBDY</u> cards are participating in the radiative interchange. In this case a 6 x 6 matrix is specified, with column one being associated with CHBDY card 200, etc.
- xi) The <u>RADMTX</u> cards are used to define the area-times-view-factor values which will be entered into the square matrix specified by the <u>RADLST</u> card, and since this matrix is symmetric, only 1/2 of it need be entered. Although the format of this card type is given in section 3.5.3 of Volume I of the <u>NTA Manual</u>, a few additional comments are useful:
 - 1) If the view factors supplied for an element sum to >1.001,* a fatal error will result in most versions (such as Levels 15.5.1, 15.5.2 and 15.5.3). If a version is used which does not make this error check, and view factors do sum to >1.0, then the results are unpredictable.
 - 2) If the view factors supplied for an element sum to <1.0, the NTA will automatically assume that the unaccounted for energy is lost to "space". Some versions (such as Levels 15.5.1, 15.5.2 and 15.5.3) will warn the user of this energy loss, but others may not, and the user should be aware of this potential invisible and infinite heat sink.
 - 3) If a column is undefined by <u>RADMTX</u> cards, or is only partially defined, it will be filled out with zeros. However, note that no embedded blank fields are allowed.

In the light of these comments it can be seen that the radiation matrix in this problem will cause all of the energy radiated from the fin to be lost to the internal "space" node. In addition, since all of the terms in the <u>RADMTX</u> are zero, it could have been left out entirely and the same answers would have resulted due to the default option mentioned in comment #3 above.

^{*}Since the <u>RADMTX</u> actually supplies area-times-view-factor values (AF values), the true criterion is that the AF sum for an element divided by that element's area be < 1.001.

e. Output Produced:

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unnumbered –

directly precedes page 7

This page of output is produced only if a DIAG 18 card is present in the Executive Control during a NLSS run, and it lists three parameters which are used by the program to determine if solution iterations may be terminated (see section 2.6.2 of Volume I of the NTA Manual for more detailed information):

- i) EPSILON P is the ratio of the change in the nonlinear load between the last two iterations to the nonlinear load calculated from the initial thermal guess vector.
- ii) LAMDA 1 is a weighted estimate of the lowest eigenvalue of the solution matrix.
- iii) EPSILON T is essentially a ratio of the sum of the changes in temperature from the previous iteration to the sum of the newest estimated temperatures.

The iteration algorithm will terminate under one of the following conditions:

- i) EPSILON T < EPSHT and EPSILON P < 10 * EPSHT Normal Convergence.
- ii) EPSILON T = 0. and EPSILON P = any value Maximum Convergence (essentially as good as Normal Convergence, but EPSILON P was not satisfied, probably due to an inaccurate thermal guess vector).*
- iii) LAMDA 1 < 1 after the fourth iteration Diverging Solution. To fix this, the user might try a higher thermal guess vector, examine the model for the unintended application of high thermal loads, and/or examine the <u>RADMTX</u> to verify that the view factors supplied do not sum to values greater than 1.001 for any element.
- iv) If MAXIT is exceeded termination due to Maximum Iterations.
- v) If an internal algorithm which estimates the time required for an iteration indicates that not enough CPU time remains for the next iteration to be completed termination due to Insufficient Time.

In this problem, termination is, as is shown, due to Normal Convergence. What is the best value to use for EPSHT? There is no one answer to this question, but commonly used values are 10^{-3} or 10^{-4} , and they have uniformly produced reliable results.

7, 8, 9 and the Run Log

This output is identical in form to that described in Problem 1. It should be noted that the modules being executed, as noted in the Run Log, are different from Problem 1 because the NLSS algorithm (<u>SOL 3</u>) is being used instead of the LSS algorithm (<u>SOL 1</u>).

^{*}This convergence message is not available on all NTA versions.

3. Sample Problem 3

- Intent: This problem converts the NLSS model of Problem 2 to an identical nonlinear transient problem, demonstrating the use of the transient solution algorithm (SOL 9).
- b. Executive Control: The only change made from Problem 2 was on the <u>SOL</u> card, where algorithm 9, the nonlinear transient solution method, was selected instead of algorithm 3, the NLSS solution method.
- c. Case Control: Several changes were made from Problem 2, as follows:
 - i) The LOAD card was changed to a DLOAD (Dynamic LOAD) card, which is required to request linear thermal loads during a transient execution. This card may reference only <u>TLOAD1</u>, <u>TLOAD2</u>, and <u>DLOAD</u> Bulk Data cards, which will, in turn, reference other linear load cards.
 - ii) The <u>TSTEP</u> (Time <u>STEP</u>) card is required to specify the identification number of the Bulk Data <u>TSTEP</u> card which will be used to define the integration time step size, the number of time steps to be solved, and the frequency with which the time steps will be printed out (i.e., every time step, or every other time step, or every third time step, etc.).
 - iii) The IC (Initial Condition) card is required to specify the set number of the <u>TEMP</u> and/or <u>TEMPD</u> cards which will be used to define the initial temperature of each <u>GRID</u> point in the model. This set number may be the same one referenced by the <u>TEMP</u> (MATERIAL) card, but in most cases a separate temperature vector will be specified.
 - iv) The <u>SET</u> card is optional, and is used here to define a group of <u>GRID</u> points which may be collectively referenced in later output requests.
 - v) The <u>OLOAD</u> card has been previously discussed, but its use here is slightly different in that it references a set number. The only requirement for the use of this option is that the set number selected be previously defined on a <u>SET</u> card in the Case Control, and the result will be that the requested output will be supplied only for the <u>GRID</u> points listed in the set. This option may be used for any of the various types of <u>NTA</u> output.
 - vi) The SPCF card is superfluous in this problem, as no SPC set is selected.
 - vii) Cards 54 through 69 supply the information required to produce printer plots of selected <u>GRID</u> point temperatures and thermal velocities (rate change of temperatures) as a function of time. The structure of this request is quite simple, in that it is initialized with an <u>OUTPUT (XYOUT)</u> card, followed by <u>XTITLE</u> and <u>YTITLE</u> cards to label the axes, and completed with an <u>XYPAPLOT</u> card which specifies the variable which is to be plotted against

- time along with the <u>GRID</u> points for which the plots will be generated. It should be noted that this group of cards must appear at the end of the Case Control Deck unless a structural plot packet is supplied (it may either precede or follow the transient plot request). Further detail on these printer plots may be found in section 4 of the NASTRAN User's Manual.
- viii) It should be noted that the <u>SPC</u> request has been removed. The reason for this is that in <u>SOL 9</u> any <u>GRID</u> point constrained by a <u>SPC</u> will remain fixed at zero degrees. This makes the <u>SPC</u> technique essentially useless in transient runs, and alternate methods for constraining <u>GRID</u> point temperatures will be discussed and applied in the Bulk Data Deck section of this problem.
- ix) The TEMP (MATERIAL) card is optional for a transient solution, but its use should improve the stability of the solution. If the transient solution is to be oscillatory in nature, the guess vector selected should approximate the estimated average temperature of each GRID point.
- d. Bulk Data: The following changes, listed at the end of the unsorted Bulk Data echo, were made to the Bulk Data to convert Problem 2 to Problem 3:
 - SPC and/or SPC1 cards may be used in <u>SOL 9</u> only to constrain temperatures to zero degrees, and are therefore essentially useless. The standard transient method of constraining a GRID point is to first give it a large conductive coupling to a "ground" at absolute zero. A large load is then applied and effectively controls the temperature of the GRID point. This procedure is analagous to the well known linear stretching of a spring as governed by the relationship F = KX. In a thermal problem, the K is the magnitude of the conductive coupling to ground, the F is the magnitude of the applied load, and the X is the fixed temperature value. This sounds somewhat complicated, but a glance at the cards involved shows that it is not. A CELAS2 card is used to define a conductive coupling of 1. x 10⁵ watts/°C between GRID point 100 and a thermal ground (an infinite heat sink at absolute zero). An SLOAD card (in conjunction with a TLOAD2 card, as will be discussed later) applies a load of 300. x 10⁵ watts to GRID point 100. Therefore, by the equation stated above, the fixed temperature is X = F/K = 300. $\times 10^5$ (watts) / 1. \times 10⁵ (watts/°C)=300°C. It should be emphasized that for this method to work. the conductive coupling to ground should be several orders of magnitude larger than the other real thermal conductances in the model. Also, a useful feature of this method is that if the load were made time-varying, the temperature of the constrained GRID point would vary proportionately.
 - ii) All linear <u>SOL 9</u> loads, as was mentioned in the Case Control section of this problem, must be applied through <u>TLOAD1</u>, <u>TLOAD2</u>, and/or <u>DLOAD</u> Bulk Data cards. In this problem, a <u>TLOAD2</u> card defines a unit multiplier which will operate from time = 0. to time = 1. x 10⁶ and during this time will apply

all load cards with a set ID of 300 (defined on field 3 of the TLOAD2 card). Both the old and new <u>SLOAD</u> cards in the problem have set ID's of 300 and will therefore be applied. In order to clarify this load application procedure further, figure 12 illustrates all of the possible logic paths which may be used successfully in <u>SOL 9</u>.

- iii) The <u>TSTEP</u> card has been mentioned in the Case Control section, and in this problem specifies 31 time steps of 30 seconds each with a printout required for every time step.*
- iv) An additional <u>TEMPD</u> card with a set ID of 600 defines the initial condition thermal vector as referenced by the IC card in the Case Control.

e. Output Produced

Page No. Description

10

This page lists the total linear thermal load applied to <u>GRID</u> point 1 at each time step in the problem. This type of output, where a single <u>GRID</u> point is examined at all time steps is known as SORT2 output. It is possible to reverse this sorting and obtain information organized to display all <u>GRID</u> points at individual time steps, which is known as SORT1 output. This will be demonstrated in Problem 4.

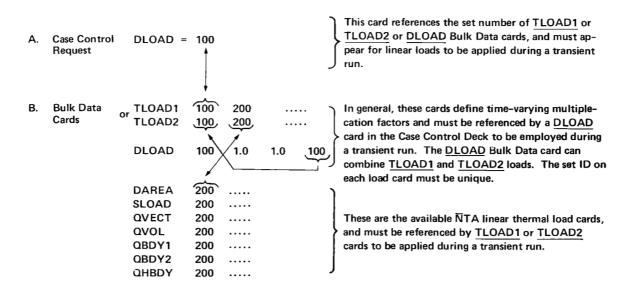


Figure 12. Applying linear transient loads.

^{*}Either 31 or 45 integration steps will be used for all problems based on Problem 3, with the smaller number being chosen to allow each transient printer plot to fit on one page.

Page No.	Description
19	This output is identical to that on page 10, except that temperatures are listed instead of linear applied loads.
30 – 35	These pages contain data used in generating the transient temp- erature plots and are generally of little interest to the user.
36 - 39	These pages contain the plots mentioned above and are essentially self-explanatory. In the first plot, of temperatures, the symbols A, *, and 0 correspond to <u>GRID</u> points 100, 1, and 4. The following three plots separately graph the thermal velocities of <u>GRID</u> points 100, 1, and 4.
Run Log	This section indicates the modules being executed for <u>SOL 9</u> , along with other data as described in Problem 1. In future problems, the Run Log will only be discussed to point out modifications which have been made to the solution algorithms.

a. Intent: This problem, which is based on Problem 3, demonstrates the use of a DMAP (Direct Matrix Abstraction Program) alter to produce SORT1 output in place of SORT2 output during a transient solution. In addition, the TSTEP card is modified to allow output only for every fifteenth time step, and a new DIAG card is included to provide a listing of the NASTRAN Source Program (often called a Rigid Format) which is executed, in this case SOL 9.

b. Executive Control:

- i) A <u>DIAG</u> 14 card has been added to produce a listing of the DMAP Source Program being executed to solve this problem. This listing will be further discussed in the Output section.
- ii) The four cards starting with <u>ALTER</u> 122 and ending with <u>ENDALTER</u> comprise an alter packet, and their purpose is to modify the Rigid Format which is called for execution by the <u>SOL 9</u> card. The general topic of NASTRAN Source Program modification, generally known as "altering", is too complicated to be treated in a rigorous manner in this text. Fortunately, all that the casual user needs to realize is that the NTA is composed basically of groups of subprograms known as modules, and that the order in which these modules are selected for execution and the input supplied to them will determine what type of problem is solved. NASTRAN Source Programs, which consist of DMAP control statements (analagous to Fortran statements) specifying the modules to be executed, exist in three fixed forms (i.e., Rigid Formats) for heat transfer problems, and may be selected by specifying SOL 1 (LSS), SOL 3 (NLSS),

or <u>SOL 9</u> (Transient). Modifications to these Rigid Formats are possible but are often complex and always extremely error prone. However, certain useful alters have been developed and incorporated into simple and reliable packets that need only be inserted into the Executive Control Deck to produce the desired result.* The user must only remember to use the alter packet with the Rigid Format for which it was designed, and that should two or more alters be desired simultaneously, the lower numbered alters must directly precede the higher numbered alters with only one <u>ENDALTER</u> card appearing at the end of all of the alters.

In this problem, the alter packet shown will eliminate the SORT2 output and replace it with SORT1. For more detailed information on the uses of DMAP, see the NASTRAN User's Manual, section 5.

- c. Case Control: No changes were made from Problem 3.
- d. Bulk Data: Field five of the <u>TSTEP</u> card was changed from 1 to 15, which will cause the output to be produced only at every fifteenth time step.

e. Output Produced:

Page No.	Description
9 – 14	These pages list the DMAP statements which comprise Rigid Format 9. Note the three statements which are labeled 122. The first statement was part of the original rigid format, while the following two were input via the alter in the Case Control.
16 – 23	These pages list the SORT1 load and thermal vectors produced at every fifteenth time step.
30 - 33	These pages contain transient plots of every fifteenth time step only.
Run Log	Note that, in comparison with Problem 3, statement 122 is executed and statement 123 is not.

- a. Intent: This problem, which is based on Problem 4, demonstrates the generation of a structural plot of the NTA model as defined by the heat conduction elements.
- b. Executive Control: Since structural plotting is done early in a NASTRAN execution, the existing alter packet from Problem 4 has been modified by the addition of an ALTER 20 and an EXIT card. These cards will cause NASTRAN to stop executing

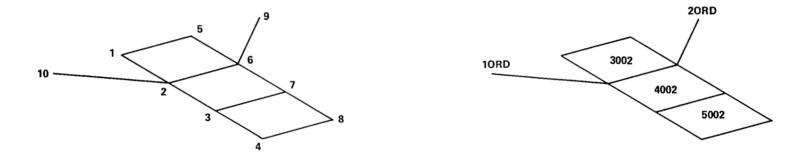
^{*}With the advent of Level 16, certain minor changes may have to be made to these alter packets.

- after DMAP statement 20 is completed. Note that the previous alter could have been removed (except for the <u>ENDALTER</u> card) without affecting the results.
- c. Case Control: A structural plot package has been added at the end of this deck. This is a general purpose request which will produce two plots (figure 13) of all of the geometrically defined heat conduction elements in the model. The first plot will have the GRID points labeled, while the second will have each element labeled. This plot package, if present, must directly precede the BEGIN BULK card, and will require that a seven-track tape be provided on unit PLT2 (consult your local NASTRAN Systems Programmer). The plot information will be placed on the tape, which then must be processed by a Stromberg-Carlson 4020 plotter to produce the plots on microfilm suitable for printing as desired. Complete plotter information (including more control cards and how to use other plotters) may be found in section 4 of the NASTRAN User's Manual.
- d. Bulk Data: No changes were made from Problem 4.

e. Output Produced:

Page No.	Description
9	Note the insertion of the $EXIT$ $\$$ after the original DMAP instruction number 20.
16 - 19	Messages from the structure plotter indicating that two plots have been generated.
Run Log	Note that execution has ceased at DMAP statement 20 due to the alter.
figure 13	Structural plots printed from microfilm.

- a. Intent: This NLSS problem is based on Problem 2 and demonstrates the modeling of thermal conductivity as a function of temperature.
- b. Executive Control: No changes from Problem 2.
- c. Case Control: No changes from Problem 2.
- d. Bulk Data: Two new types of Bulk Data cards were introduced, MATT4 and TABLEM1. The MATT4 card defines in field two the ID of a MAT4 card which is to be made temperature dependent (in this case, MAT4 1000). Field three references a TABLEM1 card which will provide coefficients as a function of temperature which will be multiplied by the conductivity specified on MAT4 1000. For example, in this problem if an element's temperature were 300 degrees Celsius, then its conductivity would be (200)(1.25) = 250 W/m ~ °C.
- e. Output Produced: No changes in the types of output requested were made from Problem 2. The answers are, of course, different and are consistent with a resultant increase in conductivity (i.e., the Single-Point Constraint Force at



NON-LINEAR TRANSIENT PROBLEM
UNDEFORMED SHAPE

NON-LINEAR TRANSIENT PROBLEM UNDEFORMED SHAPE

Figure 13. Computer-generated structure plots of the $\overline{N}TA$ model.

GRID 100 increased because the increased conductivity drained more energy from this GRID point than was lost in Problem 2).

7. Sample Problem 7

- a. Intent: This NLSS problem is based on Problem 2 and demonstrates the modeling of a convective coefficient which is a function of temperature.
- b. Executive Control: No changes from Problem 2.
- c. Case Control: No changes from Problem 2.
- d. Bulk Data: The changes made here were identical to those made in Problem 6, with the exception that a different MAT4 card (one defining a convective film coefficient) was referenced by the MATT4 card.
- e. Output Produced: The output format is identical to that of Problem 6.

8. Sample Problem 8

- a. Intent: This NLSS problem is based on Problem 2 and demonstrates the modeling of anisotropic temperature-dependent thermal conductivity.
- b. Executive Control: No changes from Problem 2.
- c. Case Control: No changes from Problem 2.
- d. Bulk Data: Two new types of Bulk Data cards were introduced, MAT5 and MATT5. They are analogous in function to MAT4 and MATT4 cards, respectively, except that they provide for the specification of anisotropic thermal conductivity (MAT5) and the independent variation of the conductivity components as a function of temperature (MATT5 with TABLEM1). A complete discussion of these card types in this manual would be excessively time consuming, so it will only be noted that the conductivity in the X-direction (along the fin axis) is defined to be identical to that of Problem 6, while the Y-direction conductivity (across the fin) is defined to be zero. See Volume I of the NTA Manual, section 3.5.3, for a detailed description of these new card types.
- e. Output Produced: The output format, and the answers, are identical to those obtained in Problem 6. This is due to the fact that since there is no temperature gradient across the fin in this simple model, the reduction in the thermal conductivity in this direction to zero does not affect the results.

9. Sample Problem 9

a. Intent: This transient problem is based on Problem 3 and demonstrates the creation of a restart tape along with the punched card checkpoint dictionary required to make use of it. The procedure given is also applicable to <u>SOL 1</u> or <u>SOL 3</u> problems. The creation of a restart tape is useful in that it allows the user to reinitiate execution at the point of termination following an

- abend, or with a minimum of repetition following a small model change. Both of these features can save substantial amounts of computer time.
- b. Executive Control: The only change made was the addition of a <u>CHKPNT</u> YES card, which specifies that a restart tape is to be prepared and that a checkpoint dictionary is to be punched to provide a description of the data files on the restart tape. These functions are completely automatic, with the user being required only to provide a tape on unit NPTP (New Problem TaPe) and to enable Fortran unit seven so that the checkpoint dictionary may be punched or directed to disk, tape, etc. Details on these procedures should be obtained from your local NASTRAN Systems Programmer.
- c. Case Control: No changes were made, except for the removal of the <u>OLOAD</u> and <u>XYPAPLOT</u> output requests and a change from <u>THERMAL</u> = ALL to <u>THERMAL</u> = 5 to reduce printed output.
- d. Bulk Data: No changes from Problem 3.
- e. Output Produced:

Page No.	Description
2	This is a printed echo of the first card punched in the check-point dictionary.
11 – 13	These pages contain printed echoes of the checkpoint dictionary, interspersed with previously seen user warning and information messages. The exact format of these checkpoint cards is not of value to the user, and it is sufficient simply to realize that each card (except the <u>REENTER</u> cards which indicate DMAP statements at which execution could be reinitiated) defines the location on tape of a certain vector or matrix of information, often called a "data block". Further information on restart may be found in section 3.1 of the NASTRAN User's Manual.
14 - 22	This is a standard SORT2 transient thermal vector as requested in the Case Control Deck.
Cards punched on Fortran unit seven	These cards, not shown here, are identical to those listed on pages 2 and 9 – 11.

a. Intent: This transient problem demonstrates the restart procedure using the restart tape and checkpoint dictionary produced in Problem 9.

- b. Executive Control: Three changes were made from Problem 9:
 - i) A transient restart error was corrected by the inclusion of the 4 card alter packet beginning with ALTER 118, 119 and ending with ENDALTER. This packet is required for all transient restarts at Level 15.5.X, and may be required for Level 16.
 - ii) The checkpoint dictionary as punched in Problem 9 is inserted. The <u>RESTART</u> card will be used to verify that the proper tape has been mounted for the restart run, while the other cards will locate relevant data blocks on the restart tape. The restart tape must be mounted on unit OPTP (Old Problem TaPe).
 - iii) The <u>CHKPNT</u> card has been removed, though it is possible to make a restart tape during a run which is initiated by a restart tape (however, unit NPTP would have to be enabled in addition to unit OPTP).
- c. Case Control: No changes from Problem 9.
- d. Bulk Data: The Bulk Data input in this case consists of cards to be added to the listing on the restart tape and / cards which define cards to be removed from the listing on the restart tape. The / cards define, based on the sorted Bulk Data numbers of the cards on the restart tape, the number or numbers of cards to be deleted during the restart run. For example, in Problem 10, card #26 from Problem 9 is to be deleted. A glance back at Problem 9 shows that this is MAT4 1000, which is logical because a new MAT4 1000 card is being provided for this restart run. A restart run in which changes of any sort are made is termed a "modified" restart, as opposed to simply resuming execution after a system failure. An examination of the new sorted Bulk Data echo indicates that the new MAT4 1000 card has indeed replaced the one used in Problem 9.

e. Output Produced:

Page No.	Description
10	This list of modified cards is of little use to the user except as a reminder of the card types which have been changed for the restart run.
11 - 16	The NASTRAN DMAP Source Program used during the restart is automatically provided, and an asterisk is placed to the left of the instruction number of each DMAP statement scheduled to be executed.
Unnumbered Page between 16 and 17	In addition to standard User and Warning messages, a list of the data blocks obtained directly from the restart tape is provided. This list is of little use to the casual user.

Page No. Description

17 - 25 The change in temperatures from Problem 9 may be observed, demonstrating the effect of the modification during the restart.

- a. Intent: Problem 11 is a transient run based on Problem 3 which demonstrates the application of arbitrary cyclical loads and the production of punched temperature cards.
- b. Executive Control: The only change from Problem 3 was the addition of a four card alter packet which will cause the output from a THERMAL request in Case Control to be produced in SORT1 format. In addition all output requests, including THERMAL, will still be produced in SORT2 format. The reason for this alter is that NTA punched temperature cards are only produced correctly during a transient run when the SORT1 format is used, as will become apparent when the output is examined. No problem of this sort exists for punching TEMP cards during NLSS or LSS runs.
- c. Case Control: Two changes were made from Problem 3:
 - i) The <u>DLOAD</u> card now references set 800 instead of 300. This was done because several load sets have been combined in the Bulk Data as set 800 and must be referenced as such to be applied.
 - ii) The <u>THERMAL</u> card now reads <u>THERMAL</u> (<u>PUNCH</u>), which will eliminate the printing of the thermal vector and will substitute the punching of temperature cards. It would also have been possible to request <u>THERMAL</u> (<u>PRINT</u>, <u>PUNCH</u>) to have obtained both types of output simultaneously.
- d. Bulk Data: Several new card types are introduced here:
 - that a <u>TABLED1</u> card (see below) is referenced in field 6 to provide a multiplying factor which varies as a function of time and will be multiplied by the loads defined by the set specified in field 3 of the <u>TLOAD1</u> card. In addition, a <u>DELAY</u> set (see below) may be (and is) referenced in field 4 of the <u>TLOAD1</u> card and specifies a time factor which is to be subtracted from the actual solution time before the <u>TABLED1</u> card is consulted for the multiplying factor.
 - ii) The <u>TABLED1</u> card defines a multiplying factor versus time relationship which may be referenced by <u>TLOAD1</u> cards. <u>TABLED2</u>, <u>TABLED3</u>, and/or <u>TABLED4</u> cards may be used to perform a similar function.
 - iii) The <u>DELAY</u> card specifies, on a <u>GRID</u> point basis, a time delay factor that may be used during the table look-up procedure described above. For example, if the solution time were at 1200 seconds, and a delay of 900 seconds

had been specified for <u>GRID</u> point 2 via a <u>DELAY</u> card, the table look-up would locate the multiplying factor corresponding to a solution time of 300 seconds.

iv) The <u>DLOAD</u> card must be used if more than one <u>TLOAD1</u> or <u>TLOAD2</u> set is to be applied simultaneously. Scale factors are provided on the card and are set to 1.0 for a simple combination of load sets.

In summary, <u>TLOAD2</u> 300 applies loads during the entire solution to <u>GRID</u> points 1 – 8, 100; <u>TLOAD1</u> 700 to <u>GRID</u> points 1 – 8 from 0 to 450 seconds; and TLOAD1 710 to GRID points 1 – 8 from 900 to 1350 seconds.

e. Output Produced:

Page No.	Description
11 -19	Note the cyclic variation of the load vectors.
After the Run Log	This section contains temperature card images as requested by THERMAL (PUNCH). The punched output has deliberately been directed to the printer for presentation purposes. The SORT1 output runs through card 672, and the error in the SORT2 output which follows is easily seen (the program attempts to print a real number, the time, in an integer field).

12. Sample Problem 12

a. Intent: This problem is meant to demonstrate the capability which exists via the VIEW⁴ program for generating view factors and RADMTX and RADLST cards directly from the CHBDY boundary element descriptions which are supplied to the NTA to define radiating surfaces. The Bulk Data from Problem 2 was used as input, with the only changes being the addition of a \$VIEW* card to define VIEW parameters, the removal of CHBDY 60 which is not a radiating surface and the referencing of the \$VIEW card from the CHBDY cards via an entry in field 9 of the CHBDY cards. Comment cards added to the Bulk Data may be seen in Problem 13, which is based on Problem 12. The RADMTX and RADLST cards produced are listed on the last page of output. Details on the operation and capabilities of the VIEW program may be found in the VIEW User's Manual⁵ and the VIEW Programmer's Manual⁶ obtainable, along with the program, from: COSMIC, Barrow Hall, University of Georgia, Athens, Georgia, 30601.

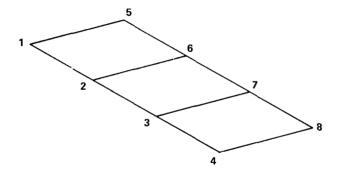
^{*}This is the only card with a "\$" in column 1 which is read as a data card by the VIEW program. All other "\$" cards are considered to be comments and are ignored.

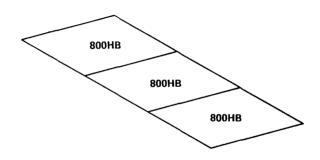
- a. Intent: This problem demonstrates a method of plotting <u>CHBDY</u> cards using a special MacNeal-Schwendler version of the NTA (check with your local NASTRAN Systems programmer). This plotting capability has not been included in the standard NTA version and therefore these boundary elements may not be plotted by them. In addition, this run, which is based on Problem 12, demonstrates that a Bulk Data Deck processed by VIEW can be immediately run on the NTA.
- b. Executive Control: The alter packet provided must be used to obtain the CHBDY plots. Also note that SOL 1 must be used.
- c. Case Control: A structural plot package has been added at the end. It is identical to that used in Problem 5, except that HBDY has been specified on the <u>SET</u> card, so only CHBDY elements will be plotted.
- d. Bulk Data: No changes were made from Problem 12, which was the VIEW run. Note the comment cards which were inserted for the VIEW run.
- e. Output: The only output of note is the <u>CHBDY</u> plots, figure 14. Note that the element numbers are not clear because of overwriting due to coincident element positions.

- a. Intent: This problem demonstrates an alternate method which may be used to constrain a point to a fixed temperature during a transient run. In Problem 3 a large load was applied to a grounded <u>GRID</u> point to fix its temperature, but in this problem the load and grounding will be replaced with the application of a large thermal mass.
- b. Executive Control: No changes were made from Problem 3.
- c. Case Control: No changes were made from Problem 3, except to reduce the amount of output requested.
- d. Bulk Data: The <u>CELAS2</u> and <u>SLOAD</u> cards affecting <u>GRID</u> point 100 were removed by converting them to comment cards. <u>CDAMP2</u> 70 was added to apply a thermal mass of 5. x 10⁸ Joules to <u>GRID</u> 100, a thermal mass much larger than that associated with the other <u>GRID</u> points in the problem. With an initial temperature of 300°C and this high thermal mass, <u>GRID</u> point 100 will tend to remain at 300°C during the solution.
- e. Output Produced:

Page No.	Description
18	The temperature of <u>GRID</u> point 100 has remained very close to 300°C.

8/28/75





LINEAR STEADY-STATE PROBLEM ... PLOT CHBDY CARDS

UNDEFORMED SHAPE

LINEAR STEADY-STATE PROBLEM ... PLOT CHBDY CARDS

UNDEFORMED SHAPE

Figure 14. Computer-generated plots of the CHBDY boundary elements.

- a. Intent: This transient problem, which is based on Problem 3, demonstrates the reduction in the emissivity of a <u>CHBDY</u> element to simulate multilayer insulation on the radiating fin surfaces. This is an extremely simplified case which would be valid only for situations in which the multilayer insulation viewed space completely. In addition, it is assumed that the thermal load on the fin is internal to the blanket.
- b. Executive Control: No changes from Problem 3.
- c. Case Control: No changes from Problem 3, except for a reduction in the output requested.
- d. Bulk Data: The only change made from Problem 3 was to reduce the emissivity specified on PHBDY 2000 from 0.9 to 0.02 (a commonly used value for the effective emissivity through a 5 10 layer aluminized mylar blanket).
- e. Output Produced: No new types of output are produced, though the reader should notice that the temperatures are, as expected, warmer than those in Problem 3.

- a. Intent: This NLSS problem, adapted from Problem 2, demonstrates another method of simulating multilayer insulation. A second layer of CHBDY cards is placed on both sides of the fin, and a convective coupling simulating an effective conductance through the multilayer insulation is defined. The old layer of CHBDY cards is no longer allowed to radiate, and the new layer now radiates in its place. The surface properties defined on this outer radiating layer would be those of the outside of the multilayer insulation. See figure 15 for a diagram of this configuration. It should be noted that this method is much more flexible than that employed in Problem 15, in that the multilayer insulation may view any other surfaces, and no effective absorbtivity for externally applied flux need be calculated.
- b. Executive Control: No changes from Problem 2.
- c. Case Control: No changes from Problem 2.
- d. Bulk Data: No new card types were input, but new GRID, CHBDY, PHBDY, and MAT4 cards define the outer radiating surface and the convective film coefficient (effective conductance) from the inner CHBDY cards to the outer CHBDY cards. In addition, the old RADLST card was removed by conversion to a comment card and replaced with a new RADLST card containing the outer layer CHBDY numbers. It is this change which transfers the radiative capability to the outer CHBDY layer.

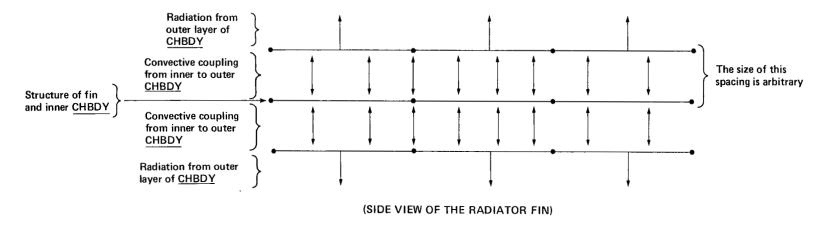


Figure 15. Multilayer insulation modeled with an effective conductance.

e. Output Produced:

Page No.	Description
Directly precedes page 9	Note that the convergence is very slow. This may be due to a poor thermal guess vector, and Problem 17 will explore this possibility.
9	In the temperature vector, note that the outer insulation temperatures are predicted to be 37 - 39°C.
11	Note that the single-point constraint force is now negative, indicating that heat must be removed from <u>GRID</u> 100 to maintain it at its fixed temperature of 300°C.

17. Sample Problem 17

- a. Intent: This problem is based on Problem 16 and demonstrates how an improved thermal guess vector can improve the convergence. In addition, the output produced by an ELFORCE request in Case Control is displayed and discussed.
- b. Executive Control: No changes were made from Problem 16.
- c. Case Control: An <u>ELFORCE</u> = ALL card was added to the output requests. This card is supposed to produce finite element temperature gradients and heat flows through all structural elements in the problem, in addition to an energy summary for each of the boundary (<u>CHBDY</u>) elements. The output produced was not completely correct, as will be discussed later.
- d. Bulk Data: <u>TEMP</u> set 400, the thermal guess vector as used in Problem 16, was modified so that it became similar to the answers obtained in Problem 16.

e. Output Produced:

Page No.	Description
Directly precedes page 9	Note that the convergence is superior to that of Problem 16.
9	Note that the major differences in temperatures from Problem 16 are in the outer layer of the insulation.
12 – 14	For the <u>CROD</u> elements, the labeled gradients are actually ΔT and the labeled heat flows are -K ΔT . For the <u>CQUAD2</u> elements, the labeled gradients are correct and the labeled heat flows are actually heat fluxes. For the heat flow summary on the <u>CHBDY</u> elements, which is correct, a positive value indicates heat flowing into a surface and vice versa.

- a. Intent: This transient problem is based on Problem 3 and demonstrates the printing out of a NASTRAN Data Block via a DMAP alter, the use of the <u>OTIME</u> option to control output times, and the output produced by the <u>ELFORCE</u> request in a transient run.
- b. Executive Control: <u>DIAG</u> 14 was added to provide a listing of the <u>SOL 9</u> Rigid Format and a three card alter packet was added which will print out the HBGG matrix, the matrix which contains the thermal masses applied to each <u>GRID</u> point in the model. This method of printing out NTA matrices is quite general and requires only that the user know the name of the matrix he wishes to print and the location where it is produced in the DMAP rigid format he has selected (the <u>MATPRN</u> request must, of course, follow the creation of the matrix to be printed). This information may be obtained from the NASTRAN Programmer's Manual and the DMAP listings, and with a little practice any user can easily examine any matrix created by the NTA.
- c. Case Control: Several changes were made, including:
 - i) Old output requests have been reduced.
 - ii) An ELFORCE = ALL output request was inserted.
 - iii) <u>SET</u> 1 was created to define a list of output times, and this set was selected by the OTIME (Output TIME) card.
- d. Bulk Data: No changes were made from Problem 3.
- e. Output Produced:

11 GRID points in the problem and therefore 11 columns in the matrix, with the lowest numbered GRID point being assigned to column 1, etc. Note that this is a diagonal matrix since the NTA uses the lumped mass rather than consistent mass formulation. See subsection 2.5.1(2) of Volume I of the NTA Manual. Note that the thermal vector is produced only for the time steps	
10	
15	·
16	Note that the thermal vector is produced only for the time steps requested by the <u>OTIME</u> set selected in the Case Control. This feature may be used with SORT1 output as well as with SORT2.

Page No.

Description

25 - 36

The labeling of the output produced for structural elements by the <u>ELFORCE</u> request has the same errors that were noted in Problem 17. However, the boundary element (<u>CHBDY</u>) heat flow summary is not present in proper format or content, an error which has been fixed in Level 15.9.

19. Sample Problem 19

- a. Intent: This transient problem is not based on any of the previous problems and is designed to demonstrate the capability of NTA to model problems via finite difference formulations (combined modes using finite difference and finite element techniques simultaneously are also feasible).
- b. Executive Control: Standard transient control cards are used.
- c. Case Control: Standard transient control cards are used.
- d. Bulk Data: This problem models the temperature decay of two conductively coupled <u>GRID</u> points, one held at a fixed temperature and the other radiating and unconstrained.
 - i) The <u>GRID</u> cards may or may not be given a precise location. Each <u>GRID</u> point may be considered as a finite difference "node".
 - ii) Each <u>GRID</u> point has thermal mass attached to it through the use of CDAMP2 cards, as described in Problem 14.
 - iii) GRID points are conductively coupled to one another through the use of CELAS2 cards. Field 3 specifies the coupling in the appropriate units (in this problem, W/°C), and fields 4 and 6 specify the GRID points which are to be coupled.
 - iv) A <u>CHBDY</u> POINT boundary element is attached to <u>GRID</u> points which are to radiate, and an area and emissivity are specified on a <u>PHBDY</u> card. <u>RADLST</u> and RADMTX data are supplied as before.
 - v) The remaining <u>PARAM</u>, <u>TEMP</u>, and <u>TSTEP</u> cards are as defined previously.
- e. Output Produced:

Page No.

Description

5-6 A standard SORT2 transient thermal vector is produced. Note that <u>GRID</u> 1 is essentially held fixed at zero degrees Celsius due to its large thermal mass. Also note that the total thermal decay time is 4.5 seconds.

- a. Intent: This transient problem is based on Problem 3 and is used to demonstrate the use of transfer functions (<u>TF</u> cards) and arbitrary nonlinear loads (NOLINi (i = 1, 2, 3, 4) cards). These cards provide great flexibility and are of use in simulating active thermal control systems.
- b. Executive Control: No changes were made from Problem 3.
- c. Case Control: A <u>NONLINEAR</u> = 900 load request was added to apply all non-linear loads with a set number of 900, and a <u>TFL</u> = 902 card selects the transfer function set, <u>TF</u>, which will be applied. Also, a <u>NLLOAD</u> card will produce a print-out of the nonlinear loads applied. This would include radiative loads, which are removed from this problem in order to prevent them from obscuring the <u>NOLINi</u> nonlinear loads.
- d. Bulk Data: Two new card types were introduced:
 - i) The <u>TF</u> card allows the user to specify the temperature and/or $\partial T/\partial t$ of an unattached and unconstrained <u>GRID</u> point in terms of the temperature and/or $\partial T/\partial t$ of one or more independent <u>GRID</u> points in the model $(\partial^2 T/\partial t^2)$ is, of course, not relevant to thermal problems). The <u>TF</u> card in this problem senses the temperature of <u>GRID</u> point 4 and sets the temperature of <u>GRID</u> point 904 equal to the negative of it. This action is purely arbitrary and is designed only to demonstrate the use of a transfer function.
 - ii) NOLIN1 cards which, like all NOLINi cards, apply loads as a function of the temperature of a referenced GRID point or points, were chosen to apply the nonlinear loads. Loads are to be applied to GRID points 1 and 5 if the temperatures of GRID points 1 and 5, respectively, are less than 300°C. For example, if the temperature of GRID point 1 were 290°C, TABLED1 9004 would be consulted and a multiplying factor of 10 would be returned. This would be multiplied by a scale factor of 1, as specified on the NOLINi card, and a load of 10 watts would be applied to GRID point 1 in the next time step. It should be realized that this is not intended to be a carefully designed thermal control system, but is rather an example of the type of capability which the NTA possesses in this area.

e. Output Produced:

Page No.	Description
12 - 13	A listing of the nonlinear loads at each time step is provided.
25	Note that the temperature of <u>GRID</u> point 904 is the negative of that of <u>GRID</u> point 4, except for the initial condition.

III. REFERENCES

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- 4. Jackson, C. E., Jr. and E. F. Puccinelli, "View Factor Computer Program (VIEW)," NASA Tech Brief B75-10032, April 1975.
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- 7. "The NASTRAN Programmer's Manual (Level 15)," NASA SP-223(01), with Level 15.5 updates, May 1973, Washington, D.C.
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APPENDIX A

CROSS-REFERENCE OF THE NTA SAMPLE PROBLEMS VS.
THERMAL ANALYSIS FEATURES DEMONSTRATED

APPENDIX A

CROSS-REFERENCE OF THE $\overline{\text{N}}$ TA SAMPLE PROBLEMS VS. THERMAL ANALYSIS FEATURES DEMONSTRATED

Thermal Analysis Feature Linear Steady-State Run		Sample Problem Number																		
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
			_										✓		<u> </u>					
Nonlinear (radiation) Steady-State Run		V				V	~	√					-			V	✓			
Nonlinear (radiation) Transient Run			V	√	√				✓	√	V			√	V			~	~	✓
DMAP Alter(s)				V	V					V	>		V					~		
Structure Plot	1				√															
Thermal Conductivity as F(T)						√														
Convective Film Coeff. as F(T)							>													
Anisotropic Thermal Conductivity as F(T)								V												
Generate a Restart Tape and a Checkpoint Deck									√											
Transient Printer Plots			V	V							>									
Reduce Transient Printout Frequency				V																
Define and Use a Set of GRID Points for Output			V	√					V	V	>			V	V			>		V
Only SORT1 Transient Output			_	V					<u> </u>											
Produces Punched Output									V		V	V								
Execute a Modified Restart										V										
Produce Punched <u>TEMP</u> Cards During a Transient Run											V									
Mixed SORT1 and SORT2 Transient Output											V									
Cyclical Transient Loads											V									
Automatically Generate RADMTX & RADLST Cards using the VIEW Program												~								
Generate CHBDY Card Plots using a MacNeal-Schwendler NTA Version													V							
Uses SPC Card(s)	V	L	L			L		L							L					
Uses SPC1 Card(s)		V				V	<u> </u>	✓	_							V	V			
Transient Run Thermal Constraints			V	✓			L		√	√	√			V	✓			\checkmark	✓	√
Uses MPC Card(s)	V	V	V	√		V	V	 	√	V	√			√	V	√	√	✓	L	√
Multilayer Insulation												Ŀ			V	V	V			
Effect of a Modified Guess Vector		L		L	L			L				L				Ĺ	V	L		
Gradient & Heat Flow Output																	V	V		
Printout of Thermal Mass Matrix			L						L						L_			√		
NTA Finite Difference Modeling			Ĺ									L							V	
Demonstrates Nonlinear Loads and Transfer Functions													Ĺ				Ĺ			V
Demonstrates OTIME Option			Г		[Γ												V		

APPENDIX B

INFORMATION AND WARNING MESSAGES PRESENT IN THE $\overline{\text{N}}\text{TA}$ SAMPLE PROBLEMS

1-

APPENDIX B $\begin{tabular}{ll} \textbf{INFORMATION AND WARNING MESSAGES PRESENT IN } \\ \textbf{THE $\overline{\textbf{N}}$TA SAMPLE PROBLEMS} \\ \end{tabular}$

		l
First Encountered in Sample Problem Number	Message	Description
1	User Information Message 3023	Informs the user about the bandwidth, the active rows and the active columns in the linear thermal stiffness (conductive) matrix.
1	User Information Message 3027	Informs the user as to the number of seconds which will be required to decompose the thermal stiffness matrix, and the type of matrix decomposition being used.
1	User Information Message 3035	Estimate of the solution error for a LSS problem—values less than 10^{-8} are generally acceptable (see section 2.6.1 of Volume I of the NTA Manual).
1	System Warning Message 3022	This message is incorrect and should be ignored.
1	User Information Message 207	This message is produced if the Bulk Data Deck is not alphabetically and numerically sorted.
2	User Information Message "Full Internal Space Node Available"	Informs the user that if the view factors do not sum to 1.0, energy will be lost to space.
2	User Information Message "6 Ele- ments have a Total View Factor Less than 0.99"	Informs the user that 6 radiating elements have view factor sums of less than 0.99.

First Encountered in Sample Problem Number	Message	Description
2	System Warning Message 2169	These messages are normal and should be ignored.
2	User Information Message 3028	Informs the user of the bandwidth, active columns, and active rows in the upper triangular portion of the final thermal stiffness matrix for a radiation problem. The BBAR and CBAR values are the bandwidth and active columns, respectively, for the lower triangular portion of the matrix.
2	User Information Message 3086	Informs the user of the reason why solution iterations were terminated during a NLSS run.
3	User Warning Message 54	Informs the user that information supplied on a <u>PARAM</u> card was not required during the program solution.
3	User Warning Message 2077	This message indicates that a DMAP output Data Block has not been created. However, no error has occurred and the warning may be ignored.

APPENDIX C COMMON \overline{N} TA USER ERRORS

APPENDIX C

COMMON NTA USER ERRORS

Inevitably, there are common mistakes that a new user is likely to make, and the purpose of this appendix is to provide a checklist of potential oversights that should be considered when an unsuccessful run is being debugged. NTA error messages vary from pinpoint problem solvers to obscure signposts, but in most cases the user will be able to use his error message and this appendix to quickly locate and correct common "new user" errors, significantly reducing the learning curve.

- 1. Do not use the GRDSET card.
- 2. Avoid the use of permanent <u>SPCs</u> specified on <u>GRID</u> cards and, in any case, never try to constrain any degree-of-freedom (DOF) other than 1.
- 3. Unless necessary, avoid the use of <u>SPOINT</u> and <u>EPOINT</u> cards use <u>GRID</u> cards instead and specify 1 whenever a DOF is requested.
- 4. Whenever a temperature guess or initial condition is input, be certain that a temperature is defined for all of the <u>GRID</u> points in the problem. The easiest way to do this is to include a TEMPD card with each temperature set defined.
- 5. If a NLSS (<u>SOL 3</u>) problem is producing overflow messages while in subroutine SSGHT, verify that:
 - a. The thermal guess vector is requested and is at least 80 percent of the true solution. Make certain that a large load is not inadvertently being applied, a situation which might cause the guess vector to be too low.
 - b. The radiation matrix columns do not sum to produce view factors greater than 1.0.
 - c. If MPCs are present, the problem does contain nonlinear loads (radiation or thermal conductivity as a function of temperature). The NTA presently has an error which will not permit linear problems with MPCs to be solved by the NLSS algorithm.
- 6. If nonlinear effects of any sort are applied to a <u>GRID</u> point, that point may only be constrained by an MPC if an equivalence is defined (i.e., one nonlinear <u>GRID</u> point temperature defined as equal to another GRID point temperature).
- 7. When transient loads are being applied many versions of the NTA (but not the GSFC Level 15.5.3 version) will require that a <u>DAREA</u> card be supplied for each load set referenced on a <u>TLOAD1</u> or <u>TLOAD2</u> card. This <u>DAREA</u> card most often is set up to simply define a zero load on an arbitrary <u>GRID</u> point (<u>DAREA</u> cards function analogously to <u>SLOAD</u> cards). If a version requires this card and it is not supplied, an abend will occur in module DPD and a message referring to a "missing table" will be produced.

- 8. When a transient restart is being executed, make certain that DMAP statements 118 and 119 (see Sample Problem 10) are forced to execute by inclusion in an Alter.
- 9. Always use <u>SPC1</u> cards, not <u>SPC</u> cards, to constrain <u>GRID</u> points during a NLSS run. The use of <u>SPC</u> cards may work, but they have been known to cause an improper partitioning of the load vector which results in incorrect answers.
- 10. When radiative interchange is included in a problem be sure to define the Stephan Boltzmann constant via a <u>PARAM</u> SIGMA card and, if the temperature input is not in absolute temperatures, the value which should be added to the temperatures before T⁴ is calculated, via the <u>PARAM</u> TABS card.
- 11. If convection is desired from a <u>CHBDY</u> card, field 3 of the <u>PHBDY</u> card which is referenced by the <u>CHBDY</u> card must in turn reference a <u>MAT4</u> card to provide the "h" value, the convective film coefficient.
- 12. Occasionally, the user may see one or more of his <u>GRID</u> points unexpectedly approach or reach a temperature of zero degrees. In this case verify that:
 - a. If convection is used, <u>GRID</u> points are defined on the <u>CHBDY</u> continuation card. Otherwise, the <u>CHBDY</u> card will convect to zero degrees.
 - b. If the problem is a transient, no <u>SPC</u> sets have been selected in the Case Control. Any GRID points constrained in this manner will remain at zero degrees.
 - c. A <u>CELASi</u> (i = 1, 2, 3, 4) card is not inadvertently coupling a <u>GRID</u> point to "ground", which is always maintained at zero degrees.
- 13. If the "THRU" option is used to reference a range of card ID numbers, cards of the proper type and ID must exist for the entire range. For example, if "1000 THRU 1005" appears on a QVECT card referencing CHBDY cards, CHBDY cards with ID's of 1000, 1001, 1002, 1003, 1004, and 1005 must all be present in the Bulk Data or an error will result.
- 14. If an attempt is made to add thermal mass to a system via a convective film coefficient applied to a CHBDY card in a convection mode, 1/2 of the mass will be applied to the CHBDY element GRID points and 1/2 to the GRID points which are convected to. Often this is not what the user desires, and it may be preferable to add extra thermal mass to a system via CDAMP2 cards (see Sample Problems 14 and 19).
- 15. The use of the "OMIT" option for non-linear problems will produce incorrect answers. This problem is currently being fixed for the transient solution algorithm.
- 16. Attempts to employ temperature-dependent thermal conductivities and convective film coefficients simultaneously in a NLSS problem have resulted in failures due to instabilities. This problem is also currently being fixed.

- 17. The <u>SUBCASE</u> and <u>REPCASE</u> options are available only for LSS thermal runs, and their uses in <u>SOL 3</u> or <u>SOL 9</u> will produce unpredictable results. Inclusion of this capability is currently being implemented in <u>SOL 3</u>.
- 18. Excessive amounts of I/O time may be used in modules such as MPYAD if a barely sufficient core space is provided. If the user suspects this problem, he should increase the region request by 50 K decimal 8-bit bytes and look in the Run Log for any improvement.
- 19. <u>CQDMEM1</u> cards are not properly handled for heat transfer in most Level 15.5 versions. <u>CQUAD1</u> or <u>CQUAD2</u> cards should be substituted if thermal runs are required.
- 20. Time-varying temperatures may be specified during transient runs by applying large time-varying loads to grounded <u>GRID</u> points (see the description of Problem 3).
- 21. The use of 7- or 8-digit <u>GRID</u> point numbers may result in a message indicating illegal bulk data on the <u>GRID</u> card in question.

APPENDIX D HOW TO DOCUMENT A NASTRAN ERROR

APPENDIX D

HOW TO DOCUMENT A NASTRAN ERROR

When a NTA user encounters an error which does not yield to his diligent and persistent investigation, he should:

- 1. Attempt to reduce the size of the problem to the minimum possible (preferably less than 50 cards) which still demonstrates the error. This is of great value in clarifying the source of the difficulty to the program analyst, but if impossible, proceed to step 2.
- 2. Run the erring problem with a <u>DIAG</u> 1, 8, 14, 15, 21, 22 card inserted in the Executive Control to produce invaluable diagnostic output for the program analyst.
- 3. If possible, generate a run with the minimum of changes required to produce a successful execution.
- 4. If an IBM machine is being used, the user should convert his final deck to BCD format. This is most easily done by assigning a temporary data set name to unit FT07F001 and punching the temporary data set in a post-NASTRAN job step (specify "COND = EVEN" if required). Any systems programmer can assist the user in this step.
- 5. Fill out an SPR (Software Problem Report) form (see the following page) as completely as possible.
- 6. Send the relevant input decks, output, and SPR to:

NASTRAN Systems Management Office (NSMO) Mail Stop 253B Langley Research Center Hampton, Virginia 23665

In addition, the NASTRAN Thermal Analysis group at the Goddard Space Flight Center would be interested in hearing about thermal errors as they are encountered. We are not in a position to formally attend to program error fixes, but on an informal basis users may call or write to:

Dr. H. P. Lee (or) C. E. Jackson, Jr. Code 322 Goddard Space Flight Center Greenbelt, Maryland 20771

Phone: 301–982–5275 IDS Code 134

and we would be glad to provide all assistance possible.

NASTPAN SOFTWARE PROBLEM REPORT (SPR)

	Date:
Originator:	NSMO Use
Organization:	
Address:	•
	Date Rec'd. :
Phone No.:	···
	Level:
Materials Submitted:	Computer:
() Output: Runs	Rigid Format:, ☐ Disp ☐ Heat ☐ Aero
() Deck	or DMAP Alters
() Plots	Error 'lessage:
() Letter	Module:
() Dump	Subroutine(s):
() Traceback	
() Fix:	
() Program Listing	
() Link Map Listing	Avoidance (if known):
() Other:	
() other.	
	Estimate correction effort (if known):
Description:	
	'10 Use
Level Fixed :	
Test Problem :	
Verified by NSMO :	

Rev 2/5/75

APPENDIX E

DANGERS IN THE USE OF NASTRAN NON-LINEAR LOADS IN STRUCTURAL TRANSIENT ANALYSES

APPENDIX E

DANGERS IN THE USE OF NASTRAN NON-LINEAR LOADS IN STRUCTURAL TRANSIENT ANALYSES

The following remarks appeared in the Navy Structures Computer Program NEWSLETTER⁸, and are reproduced here to acquaint the new user with some of the difficulties encountered in transient analyses of structural problems employing non-linear loads. Problems involving radiative heat transfer should not be considered subject to these remarks, as the thermal stiffness (conductivity) matrix has been specially conditioned in these cases.

NONLINEAR TRANSIENT ANALYSIS

NASTRAN's nonlinear transient capability is mathematically straightforward and appears to be relatively simple to use. Unfortunately, this is not always true. Typically, NASTRAN's nonlinear capability is used to provide nonlinear boundary conditions for a large structural problem that is otherwise linear or to model a few nonlinear elastic or elastic-plastic elements in a problem which consists mostly of linear elements. Persons contemplating the use of NASTRAN's nonlinear capability for these types of problems may find the following observations helpful.

A major technical difficulty with NASTRAN's nonlinear capability arises from the fact that only one numerical integration algorithm is available for transient analysis involving coupled equations. This algorithm, known as the Newmark Beta Method, uses a fixed time step size which has been chosen by the user. Although this is an efficient algorithm for large systems of linear equations, it may be quite inefficient for problems with strong nonlinearities. Usually integration algorithms which automatically vary the time step size according to some convergence criterion, are better suited for nonlinear problems.

The use of nonlinear loads and the construction of nonlinear elements also requires a lot of manual "bockkeeping" as does the use of direct input matrices and transfer functions -- offering many opportunities for data errors. Automatic data checking is not effective in detecting these errors since the nonlinear features are pure mathematical abstractions with no direct physical ties.

A prudent approach to the use of NASTRAN's nonlinear features would include experimentation with small sample problems with known solutions. Such samples can be chosen to have the essential characteristics of the problem to be solved and will permit the user to become familiar with the required procedures and will provide some insight into the intricacies of the method (particularly the selection of appropriate time step size).

One source of instability is a time lag error, which occurs because the nonlinear loads are computed for n-th time step based on displacement values at the (n-1) st time step. The larger the time step the greater the deviation of the nonlinear load from the desired value. If the time step size does not change during the solution, the value of the displacements at the n-th time step can sometimes be estimated using the following formula:

$$U_n \approx \hat{U}_{n-1} = U_{n-1} + \alpha \hat{U}_{n-1} \Delta t + \beta \ddot{U}_{n-1} (\Delta t)^2$$

where \hat{U} is introduced as a new independent variable for the nonlinear functions, $0 \le \alpha \le 1$, and $0 \le \beta \le 1$. This relationship can be defined using NASTRAN's direct input matrices or transfer functions. The \hat{U} term is seldom significant and is usually ignored. Values for α are best determined empirically. The choice, $\alpha=1$, seems to work well for short durations, but tends to cause instabilities when the integration is carried out for longer time periods.

Often the user will have a choice as to the duration of a nonlinear load. Because of the time lag error, the shorter the application of a nonlinear load the more stability the problem will exhibit. For example, in modeling a spring that "bottoms," shown in Figure 1-a, one could choose a nonlinear force, F(U), as shown in Figure 1-b (probably the most straightforward representation). Because the value of this loading function will be non-zero except when U is zero, there will be certain time lag errors added to the solution at each step of the problem. F(U) can be decomposed into the sum of a linear spring (dashed line) and a nonlinear load (solid line), as shown in Figure 1-c. Unless the loads are such that the spring is "bottomed" during most of the time history, the nonlinear force will be non-zero most of the time with the time-lag error accumulating as before. Figure 1-d also shows F(U) decomposed into a linear spring and a nonlinear load. In this case, when the spring is not "bottomed," the nonlinear load will be zero and the solution will have correspondingly less accumulated error.

A problem which seems to be related to the time lag error is an instability in the use of nonlinear loads which are dependent on velocities. An example which employs this technique is the model of a Coulomb damper given in the NASTRAN Theoretical Manual (p. 11.2-2, Dec. '72 Edition). Many people (MacNeal-Schwendler Corp., NSRDC, NASA-Goddard) have modified NASTRAN to reduce this instability by permitting nonlinear loads to be dependent directly on velocities computed by the backward difference formula

$$\dot{U}_{n} \approx \frac{1}{\Lambda t} (U_{n} - U_{n-1})^{*}$$

This technique does improve stability, but the user should be cautioned that the velocities which are output by NASTRAN are computed by a central difference formula, $\dot{\textbf{U}}_n \approx \frac{1}{2\Delta t} \; (\textbf{U}_{n+1} - \textbf{U}_{n-1})$ and may differ significantly from those used to compute the nonlinear loads.

In Navy-NASTRAN the dependent velocity is indicated by adding 10 to the component number (field 7) of the NOLINi cards (velocities of scalar points are indicated by the component number 10).

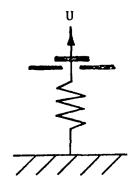


Figure 1-a

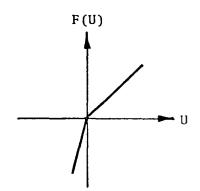


Figure 1-b

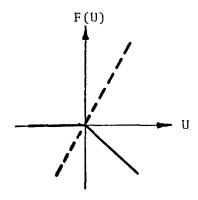


Figure 1-c

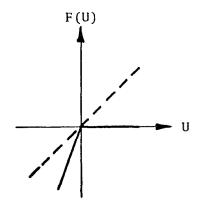
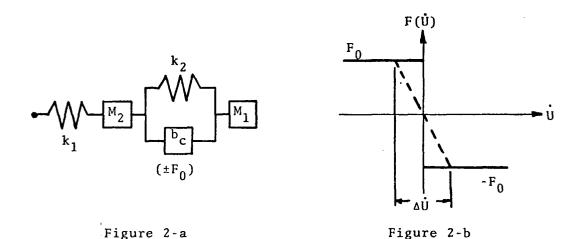


Figure 1-d

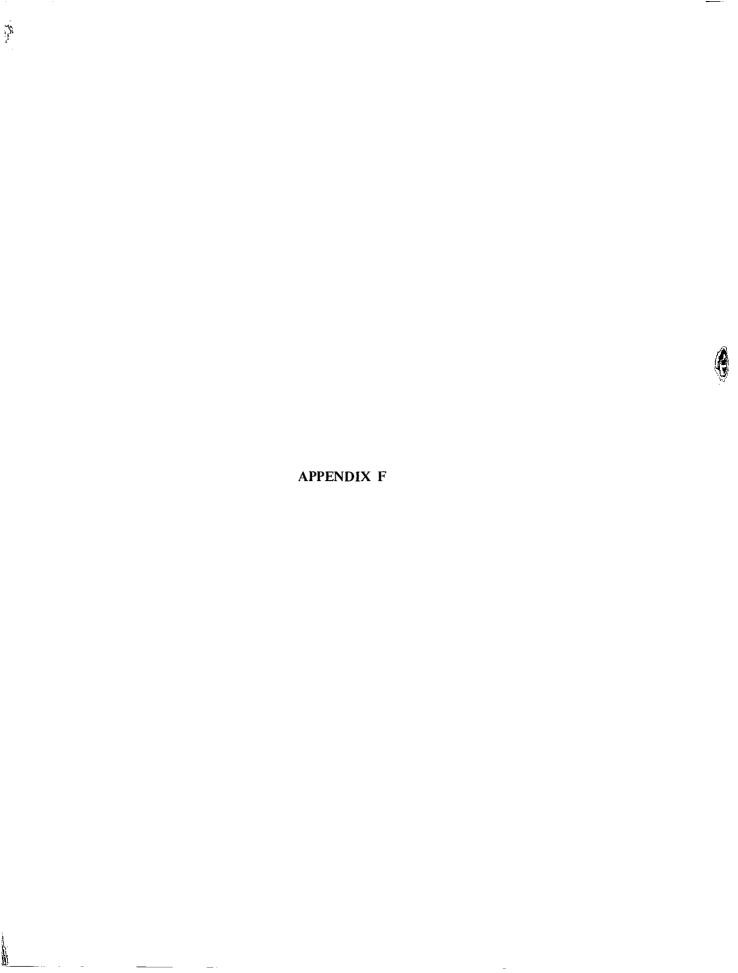
In attempting to model an elastic-plastic material following the example in the Theoretical Manual (p. 11.2-4) one encounters several problems. First, nonlinear loads which were direct functions of velocity are required to achieve a stable solution with a finite time step. Second, the model must be modified by adding a small mass, M_2 , as shown in Figure 2-a, again for stability.



Without M₂, the system responds instantaneously to the nonlinear loads associated with the Coulomb damper, b_C. This in turn causes a sign change in the velocity which causes a nonlinear load of opposite sign to be applied at the next step. This configuration does not represent the desired model for finite size time steps. Since the mass M₂ is not part of the physical system being modeled it does introduce a further level of approximation and hence M₂ should be kept small with respect to the other masses in the model. However, the smaller the value of M₂ that is chosen the smaller the time step must be for a stable solution. Ideally the nonlinear loading function for the Coulomb damper would follow the solid line with a finite jump at U=0 shown in Figure 2-b. Again, for stability reasons, the ideal function should be replaced by a continuous function such as the dashed curve in the figure. However, the dashed portion of the curve has the effect of introducing a viscous damper in the system, hence a further approximation. This damping will decrease as AU is made smaller, but correspondingly smaller time steps will be required for a convergent solution.

These observations have been made from the practical view-point of getting acceptable nonlinear solutions from NASTRAN. Obviously, many interesting theoretical questions arise which ought to be answered before a user could really feel comfortable with nonlinear functions and NASTRAN's integration algorithm. Persons contemplating a large effort involving nonlinear transient solutions should be aware of NASTRAN's current limitations. It may prove to be more economical to acquire an integration algorithm which is more amenable to nonlinear problems than to persist with the one now available in NASTRAN.

J. McKee



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MARGANIAN MARKATAN MA милимический милемамический милематериальной и принцерований и принцерований и принцерований и принцерований и

L-MINIMAMMAMMAM.

MW NIMMA - - FAMBLERO AN EALEAGE EN EN EA GENELDE MANAGEMENT DE MANGEMENT DE MANGEM MM - - RIGHTSYALIACOTOLIA UZ YOM - MEGANGENYMINERANIYONYMINERARIAMMIGENMAGINTAMAHATIMAMAMAMAM

- MINIMARIAN CONTROL IN THE PROPERTY OF THE PR

IMPROPERSY CONTRACTOR OF THE PROPERTY OF THE P

PARAMEMENTAL PROPERTY OF THE PROPERTY OF THE PARAMEMENT OF THE PAR

MARIMANIAMANAMANAMAN

IBM 360-370 SERIES MODELS 91.95

RIGID FORMAT SERIES M

LEVEL 15.5.3

MMMM

MM

MM

MMMM

MMMMM

MM: MMMM

SYSTEM GENERATION DATE 12/31/74 S START OF EXECUTIVE CONTROL AND ANALYZED FOR THE UOB

MAXIMUM CPU TIME ALLOWED FOR THE UOB

TIME 10

S THE THERMAL ANALYZER PORTION OF NASTRAN IS TO BE USED

APP HEAT

THE LINEAR STEADY-STAYE SOLUTION ALGORITHM IS TO BE USED

SOL 1
CEND

CASE CONTROL DECK ECHO.

```
CARD
COUNT
1
2
      $ END OF EXECUTIVE CONTROL --- START CASE CONTROL */*********************
      ことによるなのできることできることできることできます。これできることできます。
5
6
      TITLE= LINEAR STEADY-STATE PROBLEM
      $ SPECIFY 51 LINES OF DATA PER PAGE (DOES NOT INCLUDE HEADINGS AT TOP OF PAGE)
Р
9
10
      LINE=51
11
12
      IS REO'DEST SORTED AND UNSORTED OUTPUT
      S 19 THIS CARD IS OMITTED, ONLY THE SORTED BULK DATA WILL APPEAR
13
1.7
15
      ECHO=EOTH
15
17
     3 SELECT THE SPC. MPC. AND LOAD SETS TO BE USED IN THIS SOLUTION
13
      S
      SPC=100
19
20
      MPC=200
21
      1.040=300
22
      § . ·
23
      S SELECT THE OUTPUT DESIRED (TEMPERATURES, LOADS, AND CONSTRAINT POWERS)
24
25
      CUTPUT
26
      THEF VAL=ALL
27
      CLOADEALL
28
      SACF=ALL
29
30
      31
32
33
      $
34
      BEGIN BULK
```

3

PAGE

INPUT BULK DAŤA DECK ECHO

```
S UNITS MUST BE CONSISTENT
S IN THIS PROBLEM, METERS, WATTS, AND DEGREES CELSIUS ARE USED
S DEFINE GRID POINTS
$
                                         ů.
GRID
                                ο.
GRID
                        . 1
                                Ο.
                                         ٥.
GRID
                         . 2
                                         ٥.
GRID
GRID
        5
                        ٥.
                                         Ö.
GRID
                                         0.
                         . 1
GRID
                         . 2
                                         €.
                                 . 1
GRID
                         . 3
GRID
                                 . 2
                                         G.
                                         0.
GRID
        10 .
                                 - . 1
GRID
        100
                                 .05
                                         ٥.
$
$ CONNECT GRID POINTS
$
CROD
        10
                100
                         10
CROD
        20
                100
                        9
CQUAD2 30
                200
                        1
                                                 5
                                         6
CQUAD2 40
                200
                        2
                                         7
CQUAD2 50
                200
                         3
$
S DEFINE CROSS-SECTIONAL AREAS AND/OR THICKNESSES
Ś
                 1000
                         .001
PROD
        100
PQUAD2 200
                 1000
                         .Ċ1
S DEFINE MATERIAL THERMAL CONDUCTIVITY
$
MAT4 1000
                                                                          ALUMINUM .
                 200.
S DEFINE CONVECTIVE AREA AND CONVECTIVE COEFFICIENT 'H'
S
                                                                          +CONVEC
CHEDY 60
                 300
                        LINE
+CONVEC 100
                 100
PHEDY 300
                 3000
MAT4 3000
                 200.
$ DEFINE CONSTRAINTS
£
                 100
SPC
        100
                                 300.
MPC
        200
                                                          -1.
                                 1.
                                 1,
MPC
        200
                                         1
                                                          -1.
5
S DEFINE APPLIED LOADS
```

.

LINEAR STEADY-STATE PROBLEM

JANUARY 7. 1976 NASTRAN 12/31/74

INPUT BULK DATA DECK **ECHO**

1		2		3		4		5	`	6		7		8		9		10	
SLOAD	300		1		4.		2		8.										
SLOAD	300		3		8.		4		4.										
SLOAD	300		5		4.		6		8.										٠.
SLCAD	300		7		8.		8		4.										
\$																			•
5-4***																			
\$ END																			
5****	* * * *	* * * *	* * ~ .	****	* * * * *	***	***	7 4	****	***	* * * *	****	***	****	****	***	***	****	**
\$									-										
ENDDAT	Α								•							-			

TOTAL COUNT= 61

*** USER INFORMATION MESSAGE 207, BULK DATA NOT SORTED.XSORT WILL RE-DRDER DECK.

			SORT	ED BU	LK D	АТА	ECH	0	
CARD									
COUNT		. 2		4 . 5	6		7	8 . 9	
1 -	CHBDY	60 300		1	5				+CONVEC
2 -		100 100							
3.		30 200		2	6	5 6			
4 -		40 200		2 3 4 2	7	6			
5-	CQUAD2	50 200	3	4	8	7			
6.		10 100		2					
7 -	C べ O D	20 100	9.	6					
8-	GRID	1	0.0	0.0	0.0				
9.	GRID	2	. 1	0.0	0.0				
. 10	GRID	2 3	. 2	0.0	0.0.				
11-	GRID	4	. 3	0.0	0.0.				
12	GRID	5	0.0	. 1	0.0				
13	GRID	6	. 1	. 1	c.c				
14	GRID	7	. 2	. 1	0.0				
15	GRID	8	. ٤	. 1	0.0				
16	GRIÐ	9	0.0	. 2	0.0				
17	GRID	10	0.0	1	0.0				
18	GRID	100	05	.05	c.ď				
19	MAT4	1000 200	O.						ALUMINUM
20	MAT4	3000 200	O.						
21	MPC	200 9	1	, 1,	5	1	-1.		,
22	MPC	200 10	1	1.	1	1	-1.		
23	· PH5DY	300 309	00 .314	1					
24	PQUAD2	200 109							
25	PROD	100 100	.001						
26	SECAD	300 1	4.	2	8.				
27	- SLOAD	300 3	8.	4	4.				
28	SLOAD	300 5	4.	6	8.				
29	- SLOAD	300 7	8.	8					
30	- SPC	100 10	0 1	300.					
	ATADGME								

NO ERRORS FOUND - EXECUTE NASTRAN PROGRAM

5 0 4 *** USER INFORMATION MESSAGE 3023.

*** USER INFORMATION MESSAGE 3027. SYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

FOR LOAD 1 EPSILON SUB E = -7.6553228E-16

*** SYSTEM WARNING MESSAGE 3092

DATA BLOCK PITPAR IS REDCIRED AS INPUT AND IS NOT OUTPUT BY A PREVIOUS MODULE IN THE CURRENT DMAP ROUTE.

1-7

B5-52-

LINEAR STEADY-STATE PROBLEM . JANUARY 7, 1976 NASTRAN 12/31/74 PAGE 6

TEMPERATURE VECTOR

POINT ID.	TYPE	ID VALUE	ID+1 VALUE	ID+2 VALUE	ID+3 VALUE	ID+4 VALUE	ID+5 VALUE
1	\$	3.076433E 02	3.159275E 02	3.2 79 275E 02	3.319275E 02	3.076433E 02	3.159275E 02
7	S	3.279275E 02	3.319275E 02	3.076433E 02	3.076433E Q2	•	
100	Ś	3.000000E 02					-

LINEAR STEADY-STATE PROBLEM

JANUARY 7, 1976 NASTRAN 12/31/74 PAGE. 7

LOAD VECTOR

POINT ID.	TYPE	ID VALUE	ID+1 VALUE	ID+2 VALUE	ID+3 VALUE	ID+4 VALUE	ID+5 VALUE
1	· s	4.000000E 00	8.000000E 00	8.000COOE CO	4.000000E 00	4.000000E 00	8.000000E 00
7	S	8.00000E 00	4.000000E 00				

1-10

5

FORCES OF SINGLE-POINT CONSTRAINT

POINT ID. TYPE ID VALUE ID+1 VALUE ID+2 VALUE ID+3 VALUE ID+4 VALUE ID+5 VALUE 100 S -4.79998E 01

```
NASTRAN LOADED AT LOCATION 170F20
TIME TO GO = 179 CPU SEC., 179 I/O SEC.
     O CPU-SEC.
                      O ELAPSED-SEC.
                                        SEM1 BEGN
     O CPU-SEC.
                      O ELAPSED-SEC.
                                        SEMT
     O CPU-SEC.
                      4 ELAPSED-SEC.
                                        NAST
     O CPU-SEC.
                      4 ELAPSED-SEC.
                                        GNFI
     O CPU-SEC.
                      4 ELAPSED-SEC.
                                        XCSA
     O CPU-SEC.
                      7 ELAPSED-SEC.
                                        1591
                                        XSOR
     O CPU-SEC.
                     11 ELAFSED-SEC.
     1 CPU-SEC.
                     17 ELAPSED-SEC.
                                          50
                                              IFP
     1 CPU-SEC.
                     33 ELAFSED-SEC.
                                         CNB
                                              IFP
     1 CPU-SEC.
                     33 ELAPSED-SEC.
                                        XGPI
     3 CPU-SEC.
                     40 ELAPSED-SEC.
                                        SEM1
                                              END
     3 CPU-SEC.
                     41 ELAPSED-SEC.
                                              LINKNSC2 ---
                                        ----
     19 I/O SEC.
·LAST LINK DID NOT USE
                           G BYTES OF OPEN CORE
                     43 ELAPSED-SEC.
                                        ----
                                              LINK END ---
     3 CPU-SEC.
     3 CPU-SEC.
                     43 ELAPSED-SEC.
                                        XSFA
     3 CPU-SEC.
                     45 ELAPSED-SEC.
                                        XSFA
                                                     EEGN
     3 CPU-SEC.
                     45 ELAPSED-SEC..
                                        4
                                              GP1
     3 CPU-SEC.
                     51 ELAPSED-SEC.
                                              GP1
                                                     END
     3 CPU-SEC.
                                              GP2
                                                      BECN
                     52 ELAPSED-SEC.
     3 CPU-SEC.
                     53 ELAPSED-SEC.
                                        7
                                              GP2
                                                      END
     3 CPU-SEC.
                     54 ELAPSED-SEC.
                                        9
                                              PLISET
                                                     BEGN
     3 CPU-SEC.
                     55 ELAPSED-SEC.
                                        9
                                              PLTSET
                                                     END
     3 CPU-SEC.
                     56 ELAPSED-SEC.
                                              PRIMSG
                                                     BEGN
                                        11
     3 CPU-SEC.
                     57 ELAPSED-SEC.
                                        11
                                              PRIMSG
                                                     E! D
     3 CPU-SEC.
                     57 ELAPSED-SEC.
                                        12
                                              SETVAL
                                                     BEGN
     3 CPU-SEC.
                     57 ELAPSED-SEC.
                                              SETVAL
                                                     EŅD
                                        12
     3 CPU-SEC.
                                              GP3
                                                     BEGN
                     58 ELAFSED-SEC.
                                        20
                                              GP3
                                                      END
     3 CPU-SEC.
                     62 ELAPSED-SEC.
                                        20
                                                     BEGN
     3 CPU-SEC.
                     64 ELAPSED-SEC.
                                        22
                                              PARAM
     3 CPU-SEC.
                     64 ELAPSED-SEC.
                                        22
                                              PARAM
                                                     END
                                                      BEGN
     3 CPU-SEC.
                     65 ELAPSED-SEC.
                                        25
                                              TA1
     4 CPU-SEC.
                     79 ELAPSED-SEC.
                                        25
                                              TA1
                                                      END
     4 CPU-SEC.
                     80 ELAPSED-SEC.
                                        27
                                              PARAM
                                                     BEGN
     4 CPU-SEC.
                     80 ELAPSED-SEC.
                                        27
                                              PARAM
                                                     EN:D
     4 CPU-SEC.
                     83 ELAPSED-SEC.
                                              LINKNSO3 ---
     47 I/O SEC.
 LAST LINK DID NOT USE
                     41828 BYTES OF OPEN CORE
                                              LINK END ---
     4 CPU-SEC.
                     86 ELAPSED-SEC.
     4 CPU-SEC.
                     86 ELAPSED-SEC.
                                        32
                                              SMA1
                                                     BEGN
                                                      END
     4 CPU-SEC.
                     90 ELAPSED-SEC.
                                        32
                                              SMA1
     4 CPU-SEC.
                     94 ELAPSED-SEC.
                                        50
                                              PARAM
                                                      BEGN
     4 CPU-SEC.
                     94 ELAPSED-SEC.
                                        50
                                              PARAM
                                                     END
     4 CPU-SEC.
                     95 ELAPSED-SEC.
                                        XSFA
     4 CPU-SEC.
                     96 ELASSED-SEC.
                                        XSFA
     4 CPU-SEC.
                     98 ELAFSED-SEC.
                                        ----
                                              LINKNSO4 ---
     54 I/O SEC.
 LAST LINK DID NOT USE 23208 BYTES OF OPEN CORE
                                             LINK END ---
     4 CPU-SEC.
                     S8 ELAPSED SEC.
                                        ----
     4 CPU-SEC.
                     99 ELAPSED-SEC.
                                        53
                                              GP4
                                                     BEGN
                                              CP4
                                                      END
     -4 CPU-SEC.
                    105 ELAPSED-SEC.
                                        53
                                              PARAM
                                                     BEGN
                                        56
     4 CPU-SEC.
                    106 ELAPSED-SEC.
                    106 ELAPSED-SEC.
                                              PARAM
                                                     CAB
     4 CPU-SEC.
                    108 ELAFSED-SEC.
                                              GPSP
                                                      BEGN
```

4 CPU-SEC.

```
GPSP
    4 CPU-SEC.
                    108 ELAPSED-SEC.
                                         61
                                                      END
    4 CPU-SEC.
                    108 ELAPSED-SEC.
                                         ---- LINKN514 ---
    64 I/O SEC.
LAST LINK DID NOT USE 76084 BYTES OF OPEN CORE
                  110 ELAPSED-SEC.
                                        ---- LINK END ---
    4 CPU-SEC.
                                                     REGN
    4 CPU-SEC.
                    110 ELAFSED-SEC.
                                         62
                                              OFP
    4 CPU-SEC.
                    111 ELASED-SEC.
                                         62 OFP
                                                      END
                                         ---- LINKNS04 ---
                    112 ELAPSED-SEC.
    4 CPU-SEC.
    67 I/O SEC.
LAST LINK DID NOT USE 74704 BYTES OF OPEN CORE
                                        ---- LINK END ---
    5 CPU-SEC.
                   114 ELAPSED-SEC.
    5 CPU-SEC.
                                         66 MCE1
                    114 ELAPSED-SEC.
                                                       BEGN
                                              MCE1
    5 CPU-SEC.
                    119 ELAFSED-SEC.
                                         66
                                                       END
    5 CPU-SEC.
                    120 ELAPSED-SEC.
                                         68
                                              MCE2
                                                       BEGN
    5 CPU-SEC.
                    123 ELAPSED-SEC.
                                         MPYA D
                                               METHOD 2 NT. NBR PASSES = 1.EST. TIME =
                                                                                            0.0
    5 CPU-SEC.
                    125 ELAPSED-SEC.
                                         MPYA D
    5 CPU-SEC.
                    125 ELAPSED-SEC.
                                         MPYA D
                                               METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                            0.0
    5 CPU-SEC.
                    126 ELAPSED-SEC.
                                         MPYA D
    5 GPU-SEC.
                    126 ELAPSED-SEC.
                                         MPYA
                                               METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                            0.0
    5 CPU-SEC.
                                         MPYA D
                    127 ELAPSED-SEC.
     5 CPU-SEC.
                    127 ELAPSED-SEC.
                                         68
                                               MCE2
                                                       END
     6 CPU-SEC.
                    129 ELAPSED-SEC.
                                         74
                                               SCE1
                                                       BEGN
     6 CPU-SEC.
                    132 ELAPSED-SEC.
                                         74
                                               SCE1
                                                       END
     G CRU-SEC.
                    135 ELAPSED-SEC.
                                         XSFA
     6 CPU-SEC.
                    CG ELAPSED-SEC.
                                         XSFA
                                               RBMG2
     6 CPU-SEC.
                    116 ELAPSED-SEC.
                                         89
                                                       BEGN
                                         SDCO MP
     6 CPU-SEC.
                     17 ELAPSED-SEC.
                                         SDCO MP
     6 CPU-SEC.
                    158 ELAPSED-SEC.
                    139 ELAPSED-SEC.
     6 CPU-SEC.
                                         89
                                               RBMG2 END
     6 CPU-SEC.
                    140 ELAPSED-SEC.
                                         ---- LINKNSO5 ---
    86 I/O SEC.
LAST LINK DID NOT USE 68368 BYTES OF OPEN CORE
     6 CPU-SEC.
                 143 ELAPSED-SEC.
                                        ---- LINK END ---
     6 CPU-SEC.
                    143 ELAPSED-SEC.
                                         95
                                               SSG1
                                                       BEGN
     6 CPU-SEC.
                    151 ELAFSED-SEC.
                                         95
                                               SSG1
                                                       END
     6 CPU-SEC.
                    155 ELAPSED-SEC.
                                         100 SSG2
                                                       BEGN
     6 CPU-SEC.
                    157 ELAPSED-SEC.
                                         MPYA D
                                               METHOD 2 T ,NBR PASSES = 1,EST, TIME =
                                                                                             0.0
     6 CPU-SEC.
                     160 ELAPSED-SEC.
                                         MPYA D
                    164 ELAPSED-SEC.
     6 CPU-SEC. .
                                         MPYA D
                                               METHOD 2 NT.NBR PASSES = 1,EST. TIME =
                                                                                             0.0
     6 CPU-SEC.
                     165 ELAPSED-SEC.
                                         MPYA D
     6 CPU-SEC.
                     166 ELAPSED-SEC.
                                         100
                                               SSG2
                                                       END
                     166 ELAPSED-SEC.
     6 CPU-SEC.
                                         XSFA
     6 CPU-SEC.
                     167 ELAPSED-SEC.
                                         XSFA
     6 CPU-SEC.
                     167 ELAPSED-SEC.
                                          103
                                               SSG3
                                                       BEGN
     6 CPU-SEC.
                     167 ELAPSED-SEC.
                                         FBS
     6 CPU-SEC.
                     169 ELAPSED-SEC.
                                          FBS
     6 CPU-SEC.
                     189 ELAPSED-SEC.
                                         MPYA D
                                               METHOD 2 NT.NER PASSES = 1.EST. TIME =
                                                                                             0.0
     7 CPU-SEC.
                     171 ELAPSED-SEC.
                                         MPYA D
                     173 ELAFSED-SEC.
     7 CPU-SEC.
                                          103
                                               SSG3
     7 CPU-SEC.
                     174 ELAPSED-SEC.
                                          XSFA
     7 CPU-SEC.
                     175 ELAPSED-SEC.
                                          XSFA
     7 CPU-SEC.
                     175 ELAPSED-SEC.
                                          ----
                                              LINKNS12 ---
   104 I/O SEC.
LAST LINK DID NOT USE 24440 EYTES OF OPEN CORE
    7 CPU-SEC.
                                      --- LINK END ---
                     177 ELAFSED-SEC.
     7 CPU-SEC.
                     177 ELAPSED-SEC.
                                         110 SDR1
     7 CPU-SEC.
                     181 ELAPSED-SEC.
                                          MEYA D
                                               METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                             0.0
```

```
7 CPU-SEC.
                                         MPYA D
. *
                     182 ELAPSED-SEC.
       7 CPU-SEC.
                     182 ELAPSED-SEC.
                                         MPYA D
                                              METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                        0.0
       7 CPU-SEC.
                                         MPYA D
                     183 ELAPSED-SEC.
       7 CPU-SEC.
                     185 ELAPSED-SEC.
                                         MPYA D
                                              METHOD 2 NT.NBR PASSES = 1.EST. TIME =
       8 CPU-SEC.
                     186 ELAPSED-SEC.
                                         MPYA D
       B CPU-SEC.
                     'ES ELAPSED-SEC.
                                         110 SDR1 END !
       8 CPU-SEC.
                      191 ELAPSED-SEC.
                                         XSFA
       8 CPU-SEC.
                     192 ELAPSED-SEC.
                                         XSFA
                                         ---- LINKNS13 ---
       8 CPU-SEC.
                     192 ELAPSED-SEC.
     116 I/O SEC.
  LAST LINK DID NOT USE 78108 EYTES OF OPEN CORE
                                      ---- LINK END ---
       B CPU-SEC.
                     196 ELAFSED-SEC.
                                         119 SDR2 BEGN
       8 CPU-SEC.
                      196 ELAPSED-SEC.
                                       119 SDR2 END
       8 CPU-SEC.
                      200 ELAPSED-SEC.
       8 CPU-SEC.
                      201 ELAPSED-SEC.
                                       ---- LINKNS14 ---
 = 121 I/O SEC.
  LAST LINK DID NOT USE 25468 EYTES OF OPEN CORE
       8 CPU-SEC. 205 ELAPSED-SEC. ---- LINK END ---
                                        120 OFP BEGN
       8 CPU-SEC.
                      205 ELAPSED-SEC.
       B CPU-SEC.
                      207 ELAPSED-SEC.
                                       120 OFP
                                                      END
       8 CPU-SEC.
                      207 ELAPSED-SEC.
                                       139 EXIT
                                                      BEGN
 = 124 I/O SEC.
  LAST LINK DID NOT USE 68004 BYTES OF OPEN CORE
  AMOUNT OF OPEN CORE NOT USED = OK SYTES
```

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; '' '' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '			

MIR TROPOST STARTAMENT STARTAMENT AND THE STARTAMEN

COMMISSION OF THE PROPERTY OF

IMMINISTRATION OF THE PROPERTY OF THE PROPERTY

MULA MOSE CONTROL DAMAGE CONTROL AND A MICROSCOPIC PROGRAMMENT AND PARANAT IN GANGMARANSASIARAMANIN'AARANAN NAGALAAMANANAA AADAMAA AADAMAA AADAMAA AADAMA AADAMA AADAMA AADAMA AA Мимемом и разримуванных имперация вызвания довамов подпасна на принцения имперация.

AMEGNATANA BERAMI JAIRAMA JAIRAMA BARANA BARANA

MARKETS FARRESS 13 11-18 FARS

MEMBERS AND MANAGEMENT AND MANAGEMEN

MMMMIAN "AMMAMMAMM MMMMM MMMMMMMMMM /MM --MMMMM мммм MMMM MMMMMMM /// M MM - - 55MM MMMMMM MMMMMMMM ///MMMMMM MMM ACMM M MAN MMMM MMMM MM мммммм м MMMMMMMMM MARAMA MMMM MM - - MMMMM MMMMMMM 11111111 M MMM MM MMM MMMMM MM MMMMMMMMMM MMM MMMM// /// MMMMMM - - MMMMMM MMMMMMM /////WIGM MIGN M MMM MM MMMM MM MMMMMMMM Med NIM MMMMMagmm ---M MANAMMM 1111 111 MMMMMMM MMM MM MMMM MM MMMM MM MINIMAMMANN MMMM / /// ///MM MMMMMMMM - - - M MANUFACTOR MMMMMMM MMMMMM MMMM MM MMMMMM MINIMAMMINIM 11111 // M MMMMM - - - MMMM MMMMM ммммммм M MMM MMMMMMMMMM MM MMMMM AM////// PANAGAMAN PARADA MARADADANA NMM - - - - MMMM M MODEM MMMMMMM M MMM MM MMMM MM MMMM

////MMMMGIM MM METEROMOMIA MMMMARA ---M MIM MIM MMMMMM . MM MMMMMMAMMM MIGMEMAND MIGMEMAND MIGMEMAND MIGMEMAND MARKET

MMMANAGEREGER AND ARREST AND ARREST AND ARREST ARRE

MMMNR/MMMM MMRA BOWN - 1 MINIMARIAN MARIAN M

MISMMMMMMMMM MANAGAMA - - PANAMANAHARAR IS CARAREST PANAMANAHARAR MANAGAMANAHARAR ARABAMANAHARAR ARABAMANAHARAR MANAMANAHARAR MANAMANAMANAHARAR MANAMANAHARAR MANAMANAMANAHARAR MANAMAN

MMR - - MMMMMMEARCESMEARM MMMMMMMMMMARARESMAMMALIZERSCHRABMAMM. REFEREN

MS/M/MMM/MMN/Repoint/R

MINIMIMINATION OF THE PROPERTY OF THE PARTY O

IBM 360-370 SERIES MODELS 91 95

RIGID FORMAT SERIES M

LEVEL 15.5.3

MMMM

MM

SYSTEM GENERATION DATE 12/31/74

MMMMMM

MM

MMM

MMMM

38

BEGIN BULK

```
CONTROL
                                                  DECK ECHO
CARD
COUNT
1
2
 3
        $ END OF EXECUTIVE CONTROL --- START CASE CONTROL *****************************
       $
       TITLE=
                   NON-LINEAR STEADY-STATE PROBLEM
       S
       $ SPECIFY 51 LINES OF DATA PER PAGE (DOES NOT INCLUDE HEADINGS AT TOP OF PAGE)
        $
10
        LINE=51
11
       S
12
       $ REQUEST SORTED AND UNSORTED OUTPUT
13
       $ IF THIS CARD IS OMITTED, ONLY THE SORTED BULK DATA WILL APPEAR
14
       S
15
       ECHO=BOTH
16
       $
17
       $ SELECT THE SPC. MPC. AND LOAD SETS TO BE USED IN THIS SOLUTION
18
        $
19
       SPC=100
20
       MPC=200
21
        LOAD=300
22
       $
23
       $ SELECT THE TEMPERATURE SET WHICH IS AN ESTIMATE OF THE FINAL SOLUTION VECTOR
24
25
        TEMP(MATERIAL)=400
26
        $ SELECT THE OUTPUT DESIRED (TEMPERATURES, LOADS, AND CONSTRAINT POWERS)
28
29
       OUTPUT
30
       THERMAL=ALL
31
        OLOAD=ALL
32
        SPCF=ALL
33
34
35
36
37
       $
```

SLOAD 300

BULK DATA DECK ECHO 4 .. 5 .. 6 .. 7 .. 8 .. \$ UNITS MUST BE CONSISTENT \$ IN THIS PROBLEM, METERS, WATTS, AND DEGREES CELSIUS ARE USED \$ \$ DEFINE GRID POINTS S GRID GRID . 1 ٥. GRID GRID . 3 GRID ٥. GRID . 1 GRID . 2 GRID . 3 . 1 GRID q . 2 O. GRID 10 ٥. - . 1 ο. GRID 10,0 . 05 ο. \$ CONNECT GRID POINTS \$ CROD 100 10 10 CROD 20 100 9 CQUAD2 30 200 1 COUAD2 40 200 2 3 . COUAD2 50 200 \$ DEFINE CROSS-SECTIONAL AREAS AND/OR THICKNESSES \$ PROD 100 1000 .001 PQUAD2 200 1000 .01 \$ \$ DEFINE MATERIAL THERMAL CONDUCTIVITY \$ MAT4 1000 200. ALUMINUM \$ DEFINE CONVECTIVE AREA AND CONVECTIVE COEFFICIENT 'H' \$ CHBDY 60 300 LINE +CONVEC +CONVEC 100 100 PHBDY 300 .314 3000 MAT4 3000 200. ş. \$ DEFINE CONSTRAINTS \$ MPC -1. MPC 200 10 S DEFINE APPLIED LOADS \$

RADMTX 6 \$

```
SLOAD
                       8.
                                       Δ
                               6
SLOAD
       300
                5
                       4.
                                        8.
SLOAD
        300
                        8.
S THE FOLLOWING BULK DATA CARDS WERE ADDED TO CONVERT PROBLEM ONE TO
S PROBLEM TWO. THE ONLY BULK DATA CARD REMOVED FROM THE PREVIOUS SOLUTION WAS
S THE SPC CARD
$ THIS SPC1 CARD REPLACES THE SPC CARD REMOVED FROM ABOVE
SPC1
       100
             1
S RADIATION BOUNDARY ELEMENTS
CHBDY
                2000
                        AREA4
                        AREA4
CHBDY
        300
                2000
                        AREA4
                               3
CHBDY
        400
                2000
                        AREA4
CHBDY
        500
                2000
                               5
                        AREA4
                               6
CHBDY
        600
                2000
                                        7
CHBDY
       700
                2000
                        AREA4
                                                        3
S EMISSIVITY OF RADIATING ELEMENT
PHBDY 2000
$ ESTIMATE OF FINAL STEADY STATE SOLUTION VECTOR --- REFERENCED
S BY TEMP(MATERIAL) IN CASE CONTROL
s ·
TEMP
        400
                100
                        300.
TEMPO 400
                300.
$ PARAMETERS CONTROLLING RADIATION LOADING AND THE ITERATION LOOPING
PARAM
        TABS
PARAM
       SIGMA
               5.685E-8
PARAM
        MAXIT
               8
PARAM
       EPSHT
               .0001
S DEFINITION OF THE RADIATION MATRIX
$ ALL OF THE RADIATION GOES TO SPACE
                        400
                                500
                                        600
                                                700
RADLST 200
                        ο.
                                                Ο.
RADMTX 1
                                0.
                                        Ο.
RADMTX 2
                        ٥.
                                0.
                                        ٥.
                o.
                        ٥.
RADMTX 3
                ٥.
                                0.
                                        ٥.
RADMTX 4
                0.
                        ٥.
                                Ο.
RADMTX 5
                        ٥.
                Ο.
```

5

INPUT BULK DATA DECK ECHO

TOTAL COUNT = 107

*** USER INFORMATION MESSAGE 207. BULK DATA NOT SORTED, XSORT WILL RE-ORDER DECK.

			s 0	RTE	D B L	i L K	DATA	ECHO		
CARD					_				_	
COUNT		2	3	4	٠, 5	5	6 7	8	9	10
1 -	CHBDY	60	300	LINE	1	5				+CONVEC
2-	+CONVEC	100	100	.0544		•	•	=		
3-	CHBDY	200	2000	AREA4	1	2 3 4	6 7	5 6 7		
4-	CHBDY	300	2000	AREA4	2	3		•		
5 -	CHBDY	400	2000	AREA4	3	4	8			
6-	CHBDY	500	2000	AREA4	5	6	2	1		
7-	CHBDY	600	2000	AREA4	6	7	3	2 3		
8-	CHBDY	700	2000	AREA4	7	8 6	4	3		
9-	-CQUAD2	30	200	1	2	7	5 6			
10-	CQUAD2	40	200	2	3 4	8	7			
11-	CQUAD2	50	200	3	4	8	,			
12-	CROD	10	100	10	2 6					
13-	CROD	20	100	9 0.0	0.0	0.0				
14-	GRID	1		.1	0.0	0.0				
15-	GRID	2				0.0				
16-	GRID	3		. 2 . 3	0.0	0.0				
17-	GRID	4		0.0	0.0 .1	0.0				
18-	GRID	5 6		.1		0.0				
19-	GRID				. 1 . 1	0.0				•
20-	GRID	7 8		.2 .3	. 1	0.0				
21-	GRID	9		0.0	. 2	0.0				
22-	GRID			0.0	1	0.0				
23-	GRID	10 100		05	. 05	0.0				
24 - 25 -	GRID MAT4	1000	200.	05	. 05	0.0				ALUMINUM
	MAT4	3000	200.							A COM TIVOM
26 <i>-</i> 27-	MPC	200	9	1	1.	5	1	-1.		
	MPC	200	10	i	1.	1	i	-1.		*
28 - 29 -	PARAM	EPSHT	.0001	•	٠.		•	• •		
30-	PARAM	MAXIT	8							
31 -	PARAM .	SIGMA	5.685E-	Ω						•
32 -	PARAM	TABS	273.15	•						
33-	PHBDY	300	3000	.314						
34-	PHBDY	2000	3000	.0,4	. 90					
35-	PQUAD2	200	1000	.01	. 50					
36-	PROD	100	1000	.001						
37-	RADLST	200	300	400	500	600	700			
38-	RADMIX	1	0.0	0.0	0.0	0.0	0.0	0.0		
39-	RADMIX	2	0.0	0.0	0.0	0.0	0.0			
40-	RADMIX	3	0.0	0.0	0.0	0.0	• • •			
41 -	RADMIX	4	0.0	0.0	0.0	0.0				
42-	RADMIX	5	0.0	0.0	0.0					
43-	RADMIX	6	0.0	0.0				•		
44-	SLOAD	300	1	4.	2	8.				
45-	SLOAD	300	3	8.	4	4.				
46-	SLOAD	300	5	4.	6	8.				
47-	SLOAD	300	7	8.	8	• • •				
48-	SPC1	100	1	100	•	٠.				
49-	TEMP	400	100	300.						
50-	TEMPD	400	300.	500.						
50.	ENDDATA	400	300.							

- *** USER INFORMATION MESSAGE FULL INTERNAL SPACE NODE AVAILABLE
- *** USER INFORMATION MESSAGE . 6 ELEMENTS HAVE A TOTAL VIEW FACTOR (FA/A) LESS THAN 0.99
- *** USER INFORMATION MESSAGE 3023. B = C = R =
- *** USER INFORMATION MESSAGE 3027, SYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

- *** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKFF HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 1
- *** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKSF HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2
- *** SYSTEM WARNING MESS.GE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKFS HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2
- *** SYSTEM WARNING MESSAGE 2169. THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKSS
 HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 1
- *** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HRFN
 HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2
- *** SYSTEM WARNING MESSAGE 2169. THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HRSN
 HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2
- *** USER INFORMATION MESSAGE 3028, B = 4 BBAR = !

 C = 3 CBAR = 1

 R = 7
- *** USER INFORMATION MESSAGE 3027, UNSYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

DIAG 18 OUTPUT FROM SSGHT

ITERATION	EPSILON-P	LAMEDA - 1	EPSILON-T
=======================================			2-5
1	7.890695E-02		
2	6.5022896-03	1.366183E 01	6.337976E-04
3	1.208152E-03	5.517917E 00	3.211591E-04
4	2.370754F-04	5.129703F 00	6.8459025-05

*** USER INFORMATION MESSAGE 3086, ENTERING SSGHT EXIT MODE BY REASON NUMBER 1 (NORMAL CONVERGENCE)

2-9

The second of th

AGE

TEMPERATURE VECTOR

POINT ID.	TYPE	ID VALUE	ID+1 VALUE	ID+2 VALUE		ID+4 VALUE	
1	Ş				2.058354E 02	2.746404E 02	2.486993E 02
7	S	2.158606E 02	2.058354E 02	2.746404E 02	2.746404E 02		
100	S	3.000000E 02					•

NON-LINEAR STEADY-STATE PROBLEM JANUARY 1, 1976 NASTRAN 12/31/74 PAGE

LOAD VECTOR

POINT ID.	TYPE	ID VALUE	ID+1 VALUE	ID+2 VALUE	ID+3 VALUE	ID+4 VALUE	ID+5 VALUE
1	S	4.000000E 00	8.000000E 00	8.000000E 00	4.000000E 00	4.000000E 00	B.000000E 00
7	S	8.000000E 00	4.000000E 00				•

2-12

JANUARY 1, 1976 NASTRAN 12/31/74 PAGE

FORCES OF SINGLE-POINT CONSTRAINT

POINT ID. TYPE ID VALUE ID+1 VALUE ID+2 VALUE ID+3 VALUE ID+4 VALUE ID+5 VALUE 100 \$ 1.592588E 02

```
NASTRAN LOADED AT LCCATION 152720
TIME TO GO = 59 CPU SEC., 239 I/O SEC.
     O CPU-SEC.
                    O ELAPSED-SEC.
                                          BEGN
                                     SEM1
     O CPU-SEC.
                    O ELAPSED-SEC.
                                     SEMT
     O CPU-SEC.
                    3 ELAPSED-SEC.
                                     NAST
     O CPU-SEC.
                    3 ELAPSED-SEC.
                                     GNFI
     O CPU-SEC.
                    3 ELAPSED-SEC.
                                     XCSA
     1 CPU-SEC.
                    5 ELAPSED-SEC.
                                     1FP1
     1 CPU-SEC.
                    7 ELAPSED-SEC
                                     XSOR
                                          IFP
     1 CPU-SEC.
                    13 ELAPSED-SEC.
                                       DO
     2 CPU-SEC.
                    26 ELAPSED-SEC.
                                      END
     2 CPU-SEC.
                    26 ELAPSED-SEC.
                                     XGPI
     3 CPU-SEC.
                                     SEM1
                    31 ELAPSED-SEC.
     3 CPU-SEC.
                    31 ELAPSED-SEC.
                                           LINKNSO2 ---
    21 I/O SEC.
LAST LINK DID NOT USE
                         O BYTES OF OPEN CORE
                                     ---- LINK END ---
     3 CPU-SEC.
                    33 ELAPSED-SEC.
     3 CPU-SEC.
                    33 ELAPSED-SEC.
                                     XSFA
     3 CPU-SEC.
                    34 ELAPSED-SEC.
                                     XS-FA
     3 CPU-SEC.
                    34 ELAPSED-SEC.
                                     2
                                           GP1
     3 CPU-SEC.
                    41 ELAPSED-SEC.
                                     2
                                           GP1
                                                  END:
     3 CPU-SEC.
                                     5
                                           GP2
                                                  BEGN
                    42 ELAPSED-SEC.
                                           GP2
     3 CPU-SEC.
                    43 ELAPSED-SEC.
                                     5
                                                  END
     3 CPU-SEC.
                    43 ELAPSED-SEC.
                                     7
                                           PLTSET
                                                 BEGN
     3 CPU-SEC.
                    44 ELAPSED-SEC.
                                     7
                                           PLTSET
                                                  END
     3 CPU-SEC.
                    44 ELAPSED-SEC.
                                           PRIMSG
                                                  BEGN
                                     9
     3 CPU-SEC.
                    45 ELAPSED-SEC.
                                           PRTMSG
                                                  END
     3 CPU-SEC.
                    45 ELAPSED-SEC.
                                           SETVAL
                                                  REGN
                                     10
                                          SETVAL
     3 CPU-SEC.
                    45 ELAPSED-SEC.
                                     10
                                                  END
     3 CPU-SEC.
                                           GP3
                                                  BEGN
                    46 ELAPSED-SEC.
                                     18
     4 CPU-SEC.
                    54 ELAPSED-SEC.
                                      18
                                           GP3
                                                  END
     4 CPU-SEC.
                    55 ELAPSED-SEC.
                                      20
                                           TA1
                                                  BEGN
     4 CPU-SEC.
                    66 ELAPSED-SEC.
                                           TA1
     4 CPU-SEC.
                    67 ELAPSED-SEC.
                                           LINKNSO3 ---
    51 I/O SEC.
LAST LINK DID NOT USE
                    41928 BYTES OF OPEN CORE
     4 CPU-SEC.
                    71 ELAPSED-SEC.
                                          LINK END ---
     4 CPU-SEC.
                                     24
                                           SMA1
                                                  BEGN
                    71 ELAPSED-SEC.
                                           SMA1
     4 CPU-SEC.
                    75 ELAPSED-SEC.
                                     24
                                                  END
     4 CPU-SEC.
                                           LINKNSO5 ---
                    "6 ELAPSED-SEC.
    56 I/O SEC.
LAST LINK DID NOT USE
                    23308 BYTES OF OPEN CORE
                                     ---- LINK END ---
     4 CPU-SEC.
                    "9 ELAPSED-SEC.
     4 CPU-SEC.
                    '9 ELAPSED-SEC.
                                           RMG
                    83 ELAPSED-SEC.
     4 CPU-SEC.
                                     SDCO
     4 CPU-SEC.
                    84 ELAPSED-SEC.
                                     SDCO
                                          MP
     4 CPU-SEC.
                    35 ELAPSED-SEC.
                                     FBS
     4 CPU-SEC.
                    HT ELAPSED-SEC.
                                     FBS
     4 CPU-SEC.
                    88 ELAPSED-SEC.
                                     MPYA
                                           METHOD 2 NT, NBR PASSES = 1, EST. TIME =
                                                                                   0.0
                                     MPYA D
     4 CPU-SEC.
                    89 ELAPSED-SEC.
                                     TRAN POSE
     4 CPU-SEC.
                    89 ELAPSED-SEC.
     5 CPU-SEC.
                    91 ELAPSED-SEC.
                                     TRAN
                                          POSE
     5 CPU-SEC.
                    91 ELAPSED-SEC.
                                     MPYA
                                           METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                   0.0
     5 CPU-SEC.
                    92 ELAPSED-SEC.
                                     MPYA
```

2 - 13

.

B CPU-SEC.

```
94 ELAPSED-SEC.
                                       27• RMG
                                                     END
    5 CPU-SEC.
                                     ---- LINKNSO4 ---
                    S6 ELAPSED-SEC.
   5 CPU-SEC.
   72 I/O SEC.
LAST LINK DID NOT USE 31560 BYTES OF OPEN CORE
                                       ---- LINK END ---
    5 CPU-SEC.
                  S9 ELAPSED-SEC.
                                        32 GP4
    5 CPU-SEC.
                   99 ELAPSED-SEC.
                                             GP4
                                                     END
    5 CPU-SEC.
                   1C7 ELAPSED-SEC.
    5 CPU-SEC.
                   108 ELAPSED-SEC.
                                       38.
                                             GPSP
                                                     BEGN
                                       38 GPSP
                                                     END
    5 CPU-SEC.
                   TO ELAPSED-SEC.
                                       ---- LINKNS14 ---
    S CPU-SEC.
                   109 ELAPSED-SEC.
   83 I/O SEC.
LAST LINK DID NOT USE 76084 BYTES OF OPEN CORE
                                       ---- LINK END ---
    5 CPU-SEC.
                114 ELAPSED-SEC.
                                        39 OFP
                                                     BEGN
    5 CPU-SEC.
                   114 ELAPSED-SEC.
                                        39 OFP
                                                     END
    5 CPU-SEC.
                   115 ELAPSED-SEC.
                                        ---- LINKNSO4 ---
    5 CPU-SEC.
                   117 ELAPSED-SEC.
    87 I/O SEC.
LAST LINK DID NOT USE 74704 BYTES OF OPEN CORE
                 120 ELAPSED-SEC.
                                       ---- LINK END ---
     5 CPU-SEC.
                                        42 MCE1
                                                     BEGN
     5 CPU-SEC.
                    120 ELAPSED-SEC.
                                        42
                                             MCE1
                                                     END
     5 CPU-SEC.
                    124 ELAPSED-SEC.
                                        44
                                             MCE2
                                                    BEGN
     5 CPU-SEC.
                   124 ELAPSED-SEC.
     5 CPU-SEC.
                    127 ELAPSED-SEC.
                                        MPYA D
                                                                                         0.0
                                             METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                        MPYA D
     6 CPU-SEC.
                    128 ELAPSED-SEC.
                    128 ELAPSED-SEC.
                                        MPYA D
     6 CPU-SEC.
                                              METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                         0.0
                                        MPYA D
     5 CPU-SEC.
                    .1:9 ELAPSED-SEC.
     6 CPU-SEC.
                    100 ELAPSED-SEC.
                                        MPYA D
                                              METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                         0.0
                                        MPYA D
     6 CPU-SEC.
                    :01 ELAPSED-SEC.
     6 CPU-SEC.
                    104 ELAPSED-SEC.
                                        MPYA D
                                                                                         0.0
                                              METHOD 2 NT.NBR PASSES = 1.EST. TIME =
     6 CPU-SEC.
                    105 ELAPSED-SEC.
                                        MPYA D
     7 CPU-SEC.
                    135 ELAPSED-SEC.
                                        MPYA D
                                              METHOD 2 T ,NBR PASS 3 = 1.EST. TIME =
                                                                                          0.0
                                        MPYA D
                    136 ELAPSED-SEC.
     7 CPU-SEC.
     7 CPU-SEC.
                    136 ELAPSED-SEC.
                                        MPYA D
                                                                                          0.0
                                              METHOD 2 T ,NBR PASSES = 1.EST. TIME =
     7 CPU-SEC.
                    138 ELAPSED-SEC.
                                        MPYA D
                                             MCE2 END
     7 CPU-SEC.
                    138 ELAPSED-SEC.
                                        44
                                        ---- LINKNS07 ---
     7 CPU-SEC.
                    139 ELAPSED-SEC.
   106 I/O SEC.
LAST LINK DID NOT USE 68372 BYTES OF OPEN CORE
                                      ---- LINK END ---
     7 CPU-SEC.
                 146 ELAPSED-SEC.
                                        50 VEC
                                                   BEGN
     7 CPU-SEC.
                    146 ELAPSED-SEC.
                                        50 VEC
                                                      END
     7 CPU-SEC.
                   147 ELAPSED-SEC.
                                              PARTN BEGN
                                        51
     7 CPU-SEC.
                   147 ELAPSED-SEC.
                                              PARTN
                                                      END
     7 CPU-SEC.
                   150 ELAPSED-SÉC.
                                        51
                                              PARTN
                                                      BEGN
     7 CPU-SEC.
                    150 ELAFSED-SEC.
                                        52
                                        52
                                              PARTN END
     7 CPU-SEC.
                    152 ELAPSED-SEC.
                                              DECOMP BEGN
     7 CPU-SEC.
                    152 ELAPSED-SEC.
                                        55
                                        DECO MP
     7 CPU-SEC.
                    153 ELAPSED-SEC.
     7 CPU-SEC.
                    154 ELAPSED-SEC.
                                        DECO MP
                    157 ELAPSED-SEC.
                                        55
                                              DECOMP END
     7 CPU-SEC.
                    158 ELAPSED-SEC.
                                        XSFA
     3 CPU-SEC.
                                        XSFA
                    159 ELAPSED-SEC.
     B CPU-SEC.
                                        ---- LINKNSO5 ---
     8 CPU-SEC.
                    159 ELAPSED-SEC.
  117 I/O SEC.
LAST LINK DID NOT USE 59592 BYTES OF OPEN CORE
     8 CPU-SEC.
                 161 ELAPSED-SEC.
                                      ---- LINK'END ---
                                        59
                                              SSG1
                                                      BEGN
     8 CPU-SEC.
                    131 ELAPSED-SEC.
                                                      END
                    167 ELAPSED-SEC.
                                        59
                                              SSG1
     8 CPU-SEC.
```

63

168 ELAPSED-SEC.

SSG2

BEGN

```
B CPU-SEC.
                   171 ELAPSED-SEC.
                                      MPYA D
                                            METHOD 2 T .NBR PASSES = 1,EST. TIME #
                                                                                      0.0
     8 CPU-SEC.
                   172 ELAPSED-SEC.
                                      MPYA D
     8 CPU-SEC.
                   175 ELAPSED-SEC.
                                      MPYA D
                                            METHOD 2 NT.NBR PASSES = 1,EST. TIME =
                                                                                      0.0
     8 CPU-SEC.
                                      MPYA D
                   176 ELAPSED-SEC.
                                                  END
     8 CPU-SEC.
                   176 ELAPSED-SEC.
                                      63 SSG2
     8 CPU-SEC.
                                     66 SSGHT BEGN
                   176 ELAPSED-SEC.
     9 CPU-SEC.
                  .97 ELAPSED-SEC.
                                      66 SSGHT END
                  158 ELAPSED-SEC.
                                      ---- LINKNSO8 ---
     9 CPU-SEC.
   150 I/O SEC.
LAST LINK DID NOT USE 24432 BYTES OF OPEN CORE
     9 CPU-SEC. 205 ELAPSED-SEC. ---- LINK END ---
                                     71 PLTTRAN BEGN
     9 CPU-SEC.
                    205 ELAPSED-SEC.
                                   71 PLTTRAN END
     9 CPU-SEC.
                   207 ELAPSED-SEC.
                                   ---- LINKNS13 ---
     9 CPU-SEC.
                   208 ELAPSED-SEC.
= 156 I/O SEC.
LAST LINK DID NOT USE 73552 BYTES OF OPEN CORE
     9 CPU-SEC. 214 ELAPSED-SEC. ---- LINK END ---
     9 CPU-SEC.
                   214 ELAPSED-SEC.
                                      74 SDR2 BEGN
     9 CPU-SEC. 218 ELAPSED-SEC. 74 SDR2 END
     9 CPU-SEC.
                 218 ELAPSED-SEC. ---- LINKNS14 ---
■ 164 I/O SEC.
LAST LINK DID NOT USE 25468 BYTES OF OPEN CORE
     9 CPU-SEC.
                   226 ELAPSED-SEC. ---- LINK END ---
                                      75 OFP
                                                   BEGN
     9 CPU-SEC.
                    226 ELAPSED-SEC.
                228 ELAPSED-SEC. 75 OFP END 228 ELAPSED-SEC. ---- LINKNST3 ---
    10 CPU-SEC.
    10 CPU-SEC.
 172 I/O SEC.
LAST LINK DID NOT USE 68004 BYTES OF OPEN CORE
                   238 ELAFSED-SEC. ---- LINK END ---
    10 CPU-SEC.
                                     77 SDRHT BEGN
    10 CPU-SEC.
                   238 ELAPSED-SEC.
                   236 ELAPSED-SEC. 77 SDRHT END
238 ELAPSED-SEC. --- LINKNS14 ---
   10 CPU-SEC.
   10 CPU-SEC.
■ 181 I/O SEC.
LAST LINK DID NOT USE 39888 BYTES OF OPEN CORE
   10 CPU-SEC. 254 ELAPSED-SEC. ---- LINK END ---
                254 ELAPSED-SEC. 78 OFP
254 ELAPSED-SEC. 78 OFP
    10 CPU-SEC.
                                                   BEGN
    10 CPU-SEC.
                                                   END
   10 CPU-SEC.
                   256 ELAPSED-SEC.
                                      92 EXIT
                                                   BEGN

    183 I/O SEC.
```

LAST LINK DID NOT USE 74704 BYTES OF OPEN CORE AMOUNT OF OPEN CORE NOT USED = OK BYTES

MANAGED CONTRACTOR OF THE PROPERTY OF THE PROP

MILIN SOLOMENIC NA VICENARIO CALCANIA NA CALCANIA DE L'ARRESTA DE CONTRA L'ARRESTA L'ARRESTA DE CONTRA L'ARRESTA DE CONTRA L'ARRESTA DE CONTRA L'ARRESTA L'A MATMO IN INSPIRATOR/CONCONCIONAL ENGRACA MATRICES PART OF MINERAL MARKANINA PROPERTY MARKANINA PART OF A STATE MMR/MAR IN TRANSPORTED AND ANALYSIS OF THE PROPERTY OF THE PRO

BOOK ALLICAGE SOCIETA FORCE

INMERIOR RESIDENCE AND A CONTRACT OF THE PROPERTY OF THE PROPE MINISTER MARIAMENTA MEDITURAMINAM MAKAN MERUPARAN MAMANAN MERUPARAN MENANGKAN MENANGKA MINISTRA DE LA TRANSPORTA DEL TRANSPORTA DE LA TRANSPORTA MMSSATAMAMMAMAS A MAMAMASA SATAMASA MAMAMASA MAMAMASA A MAMAMASA A

MANAGEMENT AND A MANAGE MMMMMM MANUMENTAL MANUMENTAL MANUMENTAL MANUAL MANUMENTAL MANUMENT MMMMMINIMENTALISMENT AND ALL THE THE TRANSPORT OF THE TRA

MMMMMMMMMMM MARIAMANA MARI

MATERIAL MARKET MAMMAMA MAGGGGGG MARINIMEGRAPH /MM --MMMMMM MM MANAMARAM /// M MM--MMM MIASAMIMM MARAMMANA MMMMMM/// MMM SIMM MMM MINIMAN MINIMAN MARARAM MODELITARAM M 11111111 MMMM MM - - NAMMM SOMEOMIMM MMM MARAMMAMAM M NOTION MEMM// /// ////MMM MMMM-- MAMMAM MINIMEMENTAL MMM MMMMMMMMM MM 1.50 1111 111 MINIMANIA M - - - M MINIMANIAM MMNINGSMM M MMM MINIOR MICHIGAN MMMM / /// ///MM MMMMMMM - - - M MANAGEMAN MMMMMMMM MMMMMM

MARMA - - - MASSAGAM

MASSIMM

MM/////// MMMMM1 MARIA MAMAMAM MMM - - - - MMMM M. MARINE MAMMAMMM M ////MMWMMM MEGMANN ---M MM Main MMMAVETERS MW. MMMMM MINISTER OF THE PROPERTY OF TH

MINIMA MINIMA

11111

// M

MINISTRACTOR OF THE PROPERTY O MMMMMMARA SARAMAMMMALEN IRADAMAMASA - - MARASAMM MWMMMM MARKET MA MMMMASAMAMA MAMMAMAMAMA - - - MMMMMMMM ROMANDESIMASIAMMISIMAMINIANAN MARINGERIAMMINIMAMMI

MMMAMARIAN MARANIANI - MARIYAMAAN

MMEASIMMEASIMMEASIMM

MODERATION OF THE PROPERTY OF

- MMMCALISIAM NEU PARALISMANIA MARPINIA MARALISMANIA MARPINIA MARP

MINIMARY MANY MANY SACRETIMENT AND AN ARROY NAMED AND ARROY OF A SACRETIMENT AND ARROY OF A SACRETIMEN

NIMMIMMIANIMMOSTAN WORKERMINGTON COMMISSIONS AND A COMMISSION OF THE PROPERTY

IBM 360-370 SERIES MODELS 91.95

RIGID FORMAT SERIES M

LEVEL 15.5.3

MMMM

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MM MMMM мм MMMM MM MMMM. MMMMMM ММ MMMMMMMMMM MM MMMMM MMMM ММ MMMM MMMM MMMM MMMMMM MMMM MM

MMM

M MMM

N.MMRSMMM

SYSTEM GENERATION DATE - 12/31/74

MMMMM

MMMM

MM MMM

MMM

NASTRAN EXECUTIVE CONTROL DECK ECHO

CASE CONTROL DECK ECHO

```
CARD
COUNT
 1
 2
        $ END OF EXECUTIVE CONTROL --- START CASE CONTROL ***********************
        TITLE=
                 NON-LINEAR TRANSIENT PROBLEM
        $ SPECIFY 51 LINES OF DATA PER PAGE (DOES NOT INCLUDE HEADINGS AT TOP OF PAGE)
        LINE=51
        $
        S REQUEST SORTED AND UNSORTED OUTPUT
12
        $ IF THIS CARD IS OMITTED, ONLY THE SORTED BULK DATA WILL APPEAR
13
14
15
        ECHO=BOTH
16
17
        $ SELECT THE MPC AND LOAD SETS TO BE USED IN THIS SOLUTION
18
        $ NOTE THAT NO SPC SET IS SELECTED AND THAT DLOAD HAS REPLACED LOAD.
19
20
        MPC=200
21
        DLOAD=300
22
23
        $ SELECT THE TEMPERATURE SET WHICH IS AN ESTIMATE OF THE FINAL SOLUTION VECTOR
24
        $ THE SELECTION OF THIS SET IS OPTIONAL FOR SOL 9, BUT SHOULD BE MADE IF
25
        $ THE FINAL TEMPERATURE IS SEVERAL HUNDRED DEGREES DIFFERENT FROM THE
26
        $ IC VECTOR, AND RADIATIVE INTERCHANGES ARE INCLUDED.
27
- 28
        TEMP(MATERIAL)=400
29
30
        $ SELECT THE STEP SIZE, NUMBER OF INCREMENTS, AND PRINTOUT FREQUENCY
31
32
        TSTEP=500
33
34
        $ SELECT THE TEMPERATURE SET DEFINING THE TEMPERATURE VECTOR AT T=O.
35
36
        IC=600
37
38
        $ SELECT OUTPUT DESIRED
39
40
        OUTPUT
41
        THERMAL=ALL
42
43
        $ DEFINE A GROUP OF GRID POINTS TO BE REFERENCED BY AN OUTPUT REQUEST
44
45
        SET 5 = 1,2.3,4,5,6,7,8,100
46
47
        $ REFERENCE A PREVIOUSLY DEFINED GROUP OF GRID POINTS
48
        $
49
        OLOAD=5
50
51
        $ THE FOLLOWING CARDS REQUEST 4 FRAMES OF TRANSIENT PLOTS
```

3

PAGE

CASE CONTROL DECK ECHO

```
CARD
COUNT
52
      $ THESE PLOTS WILL BE PRODUCED IMMEDIATELY ON THE PRINTER
53
54
      OUTPUT(XYOUT)
55
      XTITLE=TIME IN SECONDS
56
      YTITLE = DEGREES CELSIUS GP(100,1,4)
57
58
      $ 'DISP' MEANS THAT THE GRID POINT TEMPERATURE WILL BE PLOTTED VERSUS TIME
59
      $ 'T1" IS REQUIRED (VESTIGIAL REMNANT FROM THE STRUCTURAL VERSION OF NASTRAN)
60
      $ ALL OF THESE PLOTS WILL APPEAR ON ONE FRAME
61
62
      XYPAPLOT DISP/100(T1), 1(T1), 4(T1)
63
      XTITLE=TIME IN SECONDS
64
      YTITLE= DEGREES CELSIUS PER SECOND GP(100.1,4)
65
66
      $ 'VELO' MEANS THAT THE THERMAL VELOCITY WILL BE PLOTTED AS A FUNCTION OF TIME
67
      $ THESE THREE PLOTS WILL APPEAR ON THREE DIFFERENT FRAMES
68
69
      XYPAPLOT VELO/100(T1)/1(T1)/4(T1)
70
71
      72
      73
74
75
      BEGIN BULK
```

INPUT BULK DATA DE'CK ECHO

```
5 .. 6 .. 7 .. 8 .. 9 .. 10 .
$ UNITS MUST BE CONSISTENT
$ IN THIS PROBLEM. METERS, WATTS, AND DEGREES CELSIUS ARE USED
S DEFINE GRID POINTS
$
GRID
                        ٥.
                                ο.
                                        ٥.
GRID
        2
                                0.
                                        0.
                        . 1
GRID
        3
                        . 2
                                Ο.
                                        0.
GRID
                        . 3
                                        ٥.
GRID
        5
                        ٥.
                                        О.
                                . 1
GRID
        6
                        . 1
                                        Ο.
                                . 1
GRID
        7
                        . 2
                                . 1
                                        О.
GRiD
        8
                        . з
                                        Ο.
GRID
        9
                        ٥.
                                . 2
                                        Ο.
GRID
        10
                        Ο.
                                - . 1
                                        Ci.
CRID
        100
                        - . 05
                               . 05
                                        Ο.
$
$ CONNECT GRID POINTS
$
CROD
        10
                100
                        10
CROD
        20
                100
                        9
                                6
CQUAD2 30
                                2
                                                5
                200
                        1
CQUAD2 40
                        2
                200
                                3
                                                6
COUAD2 50
                200
                        3
$
$ DEFINE CROSS-SECTIONAL AREAS AND/OR TH. JKNESSES
S
PROD
        100
                1000
                        .001
PQUAD2 200
                1000
                        .01
$ DEFINE MATERIAL THERMAL CONDUCTIVITY AND THERMAL MASS
S
MAT4 1000
                200.
                        2.426+6
                                                                         ALUMINUM
$ DEFINE CONVECTIVE AREA AND CONVECTIVE COEFFICIENT 'H'
CHEDY
       60
                300
                        LINE
                                                                         +CONVEC
+CONVEC 100
                100
PHBDY
       300
                3000
                         314
MAT4
        3000
                200.
`$
S DEFINE CONSTRAINTS
$
MPC
                9
                                                         -1.
                                1.
MPC
        200
                                                         -1.
                10
$
S DEFINE APPLIED LOADS
$
       300
                                2
                                        8.
SLOAD
```

INPUT BULK DATA DECK ECHO

```
1 .. 2 ..
                 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10
SLOAD
      300 3
                    8.
                           4
                                  4.
SLOAD
      300 - 5
                    4.
                           6
                                   8.
      300
                     8.
SLOAD
            7
'$ THE FOLLOWING BULK DATA CARDS WERE ADDED TO CONVERT PROBLEM ONE TO
S PROBLEM TWO. THE ONLY BULK DATA CARD REMOVED FROM THE PREVIOUS SOLUTION WAS
S THE SPC CARD
& THIS SPC1 CARD REPLACES THE SPC CARD REMOVED FROM ABOVE
SPC1
      100
$ RADIATION BOUNDARY ELEMENTS
       200 `
CHBDY
              2000
                     AREA4
                     AREA4 2
CHBDY
       300
              2000
CHBDY '
       400
              2000
                     AREA4
                           3
                                   4
CHBDY
       500
              2000
                     AREA4
                           5
                                   6
                                          2
                                                 1
CHBDY
       600
              2000
                     AREA4
                           6
                                   7
                                                 2
CHBDY
       700
              2000
                     AREA4
$ EMISSIVITY OF RADIATING ELEMENT
$
PHBDY 2000
                            . 90
S ESTIMATE OF FINAL STEADY STATE SOLUTION VECTOR --- REFERENCED
$ BY TEMP(MATERIAL) IN CASE CONTROL
$
TEMP
       400
              100
                     300.
TEMPD 400
              300
$ PARAMETERS CONTROLLING RADIATION LOADING AND THE ITERATION LOOPING
PARAM
      TABS
              273.15
       SIGMA 5.685E-8
PARAM
       MAXIT 8
PARAM
PARAM
      EPSHT .0001
S
S DEFINITION OF THE RADIATION MATRIX
$ ALL OF THE RADIATION GOES TO SPACE
RADLST 200
                     400
                            500
                                   600
                                          700
              300
RADMTX 1
              0..
                     Ο.
                            ٥.
                                   Ο.
                                          ο.
                                                 ٥.
                     0.
RADMTX 2
                            0.
              ο.
                                   Ο.
                                          ٥.
RADMTX 3
              ٥.
                     0..
                            Ο.
                                   Ο.
RADMTX 4
              0.
                     0. .
                            Ο.
RADMTX 5
                     ٥.
              ٥.
RADMTX 6
              ٥.
```

INPUT BULK DATA DECK ECHO

```
1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 .
$ THE FOLLOWING BULK DATA CARDS WERE ADDED FOR THE TRANSIENT SOLUTION -------
$ THEY CONVERT PROBLEM TWO TO PROBLEM THREE
$ NOTE THAT THE SPC1 SET WAS NOT SELECTED IN CASE CONTROL
$ NOTE THAT SPCF OUTPUT IS NOT REQUESTED IN TRANSIENT
$ NOTE THAT THERMAL MASS WAS ADDED TO 'MAT4' CARD 1000
$ NOTE THAT THE DIAG CARD IN THE EXECUTIVE CONTROL WAS IRRELEVANT
.S NOTE THAT THE LOAD REQUEST IN CASE CONTROL IS NOW A DLOAD REQUEST
$ TRANSIENT SINGLE POINT CONSTRAINT METHOD
$ CONSTRAIN GRID POINT 100 TO 300 DEGREES CELSIUS
CELAS2 300
             1.+5
                    100
SLOAD 300
             100
                    300.+5
S DEFINES A CONSTANT LOAD SET APPLIED FROM T=0. TO T=1.+6 SECONDS
TLOAD2 300
             300
                                                             +TL1
+TL1
      Ο.
             ٥.
S DEFINES THE NUMBER OF INCREMENTS, THE STEP SIZE, AND THE PRINTOUT FREQUENCY
$ REFERENCED IN CASE CONTROL AS 'TSTEP'
$ EACH TIME STEP IS 30 SECONDS
$ 31 ITERATIONS SELECTED TO ALLOW THE PRINTER PLOT TO FIT ON ONE PAGE ...
$ 45 ITERATIONS ARE SELECTED IN ALL TRANSIENT PROBLEMS EXCEPT THREE AND ELEVEN
TSTEP 500
             31
                    30. 1
S DEFINES A TEMPERATURE VECTOR --- REFERENCED IN CASE CONTROL AS 'IC'
TEMPD 600
             300.
S
ENDDATA
```

FOTAL COUNT= 140

^{***} USER INFORMATION MESSAGE 207, BULK DATA NOT SORTED, XSORT WILL RE-ORDER DECK.

			S 0	RTED	BUL	K DA	T A E	СНО	
CARD									
COUNT	1	. 2	3.			. 6.	. 7 .	. 8 9.	10
1 -					1	_			1
2+				LINE	1	5			+CONVEC
3-	+CONVEC 1		00		_	•	_	_	
4-					1	2	6	5	
5-					2		7	6	
6-							8	7	
7 -						6	2	1	
8-				AREA4		7	3	2	
.9-					7 2	8 6	4	3	
10- 11-				1 2	3	7	5 6 ·	**	
12-				3	4	8	7		
13-				10	2	0	•		
14-				9	6				
15-		1		0.0		0.0			
16-		2		.1		0.0			
17-		3		.2		0.0			
18-	GRID	4		. <u>.</u>	0.0	0.0			
19-		5		0.0	.1	0.0			
20-		6		. 1	. 1	0.0			
21~	GRID	7		. 2	. 1	0.0			
22-		В		. 3	. 1	0.0			•
23-	GRID	9		0.0	. 2	G.O			
24-	GRID	10		0.0	1	0.0			
25-	GRID	100		05	. 05	0.0			
26-	MAT4	1000 2	00.	2.426+6					ALUMINUM
27-	MAT4	3000 2	200.						
28-		200 · 9		1	1.		1	-1.	
29-				1	1.	1	1	-1.	
30 -			0001						
31 -		B TIXAM							
32-			.685E-8	,					
33-			73.15	.54.4					
34-			3000.	.314					
35 -		2000	000	0.1	.90				
36- 37-			000	.01					
38-			000 300	400	500	600	700		
39-			0.0	0.0	0.0	0.0	0.0	0.0	
40-			0.0	0.0	0.0	0.0	0.0	0.0	
41 -				0.0	0.0	0.0	0.0		
42-			0.0	0.0	0.0				
43-			0.0	0.0					
44 -			0.0						
45 -		300 1		4.	2	8.			
46-		300 3		8.	4	4.			
47-	SLOAD	300 5		4.	6	8.			
48-		300 7		8.	8	4.			
49-			00	300.+5					
50-		100 1		100					
51 -	TEMP	400 1	00	300.					

JANUARY 1, 1976 NASTRAN 12/31/74 PAGE

NON-LINEAR TRANSIENT PROBLEM

SORTED BULK DATA ECHO

			5 (0 K '								_		۵	10	
CARD COUNT 52- 53- 54- 55- 56-	1 TEMPD TEMPD TLOAD2 +TL1 TSTEP ENDDATA	400 600 300 0. 500	300. 300. 300. 300 0. 31	30.	4	1	5	0.4		7 +6	ο.		0.0		L1	•

NASTRAN SOURCE PROGRAM COMPILATION DMAP-DMAP INSTRUCTION . NO.

*** USER WARNING MESSAGE 54.
PARAMETER NAMED EPSHT NOT REFERENCED

*** USER WARNING MESSAGE 54
PARAMETER NAMED MAXIT NOT REFERENCED

NO ERRORS FOUND - EXECUTE NASTRAN PROGRAM

*** USER INFORMATION MESSAGE FULL INTERNAL SPACE NODE AVAILABLE

*** USER INFORMATION MESSAGE . 6 ELEMENTS HAVE A TOTAL VIEW FACTOR (FA/A) LESS THAN 0.99

*** USER INFORMATION MESSAGE 3023, B = C =

*** USER INFORMATION MESSAGE 3027, SYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

*** USER INFORMATION MESSAGE 3028, B = 5 BBAR = 5 C = 3 CBAR = 1

*** USER INFORMATION MESSAGE 3027, UNSYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS

TIME		TYPE	VALUE	
0.0		S	4.000000E	00
3.000000E	01	S	4.000GGGE	00
6.000000E	01	5	4.000000E	00
9.000000E	01	S	4.000000E	00
1.200000E	02	S	4.000000E	00
1.500000E	02	S	4.00000GE	00
1.800000E	02	S	4.000COCE	00
2.100000E	02	S	4.000000E	00
2.400000E	02	S	4.000000E	00
2.700000E	02	S	4.000000E	00
3.000000E	02	S S	4.000000E	00
3.300000E	02	S	4.000000E	00
3.600000E	02	S	4.000000E	00
3.900000E	02	Š	4.000000E	00
4.200000E	02	S	4.000000E	00
4.500000E	C2	S	4.000000E	00
4.80000CE	02	S	4.000000E	00
5.100000E	02	S	4.000000E	00
5.400000E	02	S	4.000000E	00
5.70000Œ	02	S	4.000000E	00
6.000000E	02	S	4.000000E	00
6.300000E	02		4.000000E	00
6.600000E	02	S 5	4.000000E	00
6.90000E	02	S	4.00000GE	00
7.200000E	02	S	4.000000E	00
7.500000E	02	S	4.000000E	00
7.8000005	02	S	4.00000E	00
8.100000E	02	S	4.000000E	00
8.400000E	02	S	4.00000CE	00
8.700000E	02	S	4.00000E	00
9.00000E	02	S	4.00000E	00
9.30000E	02	S	4.000000E	00

11

TIME 0.0 3.000000E 6.000000E 9.00000E 1.20000E 1.50000E 1.50000E 2.100000E 2.400000E 3.300000E 3.300000E 4.200000E 4.500000E 5.100000E 5.100000E 6.000000E 6.900000E 6.900000E 7.500000E 7.500000E 8.100000E	PP 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	VALUE 8.00000E	000000000000000000000000000000000000000
			-

TIME		TYPE	VALUE	
0.0		Ş	8.00000E	00
3.000000E	01	Š	8.000000E	00
6.000000E	01		8.000000E	00
	-	5		
9.00000CE	01	s s	B.CCCOOOE	00
1.200000E	02	S	8.00000E	00
1.50000E	02	s	8.000000E	00
1.800000E	02	S	8.000000E	00
2.100000E	02	S	8.000000E	00
2.400000E	02	S	8.000000E	00
2.700000E	02	S	8.000000E	00
3.000000E	02	S	8.000000E	00
3.300000E	02	S	8.0000005	00
3.60000CE	02		8.00000CE	00
3.90000CE	02	s s	8.0000COE	00
4.200000E	02	Š	8.000000E	00
4.500000E	02	Š	30000008	00
4.800000E	02	s s	8.0000005	00
5.100000E	02	S.		
		3	8.000000E	00
5.400000E	02	S	8.000000E	00
5.700000E	02	s s	8.000000E	00
6.000000E	02		8.000000E	00
6.300000E	02	s s	B.000000E	00
6.600000E	02	S	8.00000E	00
6.90000E	02	S	8.000000E	00
7.200000E	02	S	300000E	00
7.500000E	02	S	8.000000E	00
7.80JOOOE	02	S	8.000000E	00
8.100000E	02	S	8.000000E	00
8.400000E	02	S	8.00000E	00
8.700000E	02	S	8.000000E	00
9.000000E	02	Š	B.OCOCOOE	00
9.300000E	02	š	8.000000E	00
2.000000		-	J. 000000L	~

TIME 0.0 3.000000E 0 6.000000E 0 9.000000E 0	1 S	VALUE 4.000000E 00 4.000000E 00 4.000000E 00 4.000000E 00
1.200000E 0	_	4.000000E 00 4.000000E 00
1.800000E 0		4.000000E 00
2.100000E 0	2 5	4.000000E 00
2.400000E 0		4.000000E 00
2.700000E 0		4.000000E 00
3.000000E 0	2 S	4.000000E 00
3.3000QGE 0		4.000000E 00
3.600000E 0		4.000000E 00
3.900000E 0		4.000COOE 00
4.200000E 0		4.000000E 00
4.500000E 0		4.000000E 00
4.600000E 0 5.100000E 0		4.000000E 00
5.400000E 0		4.000000E 00 4.000000E 00
5.700000E 0		4.000000E 00
6.000000E 0		4.000000E 00
6.300000E 0		4.000000E 00
6.600000E 0		4.000000E 00
6.900000E 0	2 5	4.000000E 00
7.200000E 0		4.000000E 00
7.500000E 0		4.000000E 00
7.60000CE 0		4.000000E 00
B.100000E 0		4.00000E 00
8.400000E 0		4.000COOE 00
8.700000E 0		4.000000E 00
9.000000E 0		4.000000E 00
9.300000E 0	2 5	4.000000E 00

TIME 0.0 3.000000E 01 6.003000E 01 1.200000E 01 1.500000E 02 1.500000E 02 2.100000E 02 2.700000E 02 3.000000E 02 3.000000E 02 3.000000E 02 4.500000E 02 4.500000E 02 4.500000E 02	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	VALUE 4.000000E 00 4.00000E 00 4.00000E 00 4.00000E 00 4.00000E 00 4.00000E 00 4.00000E 00
5.400000E 03 5.700000E 03 6.000000E 03	2 S 2 S	4.000000E 00 4.000000E 00 4.000000E 00
6.30000E 02 6.60000E 02 6.90000E 02 7.20000E 02 7.50000E 02 7.50000E 02 8.10000E 02 8.70000E 02 9.30000E 02 9.30000E 02	S S S S S S S S S S S S S S S S S S S	4.00000E 00 4.00000E 00 4.00000E 00 4.00000E 00 4.00000E 00 4.00000E 00 4.00000E 00 4.00000E 00 4.00000E 00

T ****	TV	
TIME	TYPE	VALUE
0.0	S	8.000000E 00
3.000000E 01 6.000000E 01	\$ \$	8.000000E 00
		8.000000E 00
	S	8.000000E 00
1.200000E 02		8.000000E 00
1.5000COE 02		8.000000E 00
1.800000E 02		8.000000E 00
2.100000E 02		8.000000E 00
2.400000E 02	S	8.000000E 00
2.700000E 02		8.000000E 00
3.000000E 02		8.000000E 00
3.30000QE 02		8.000000E 00
3.600000E 02		8.000000E 00
3.900000E 02	. S	8.000000E 00
4.200000E 02		8.000000E 00
4.500000E 02		8.000000E 00
4.8000COE 02		8.000000E 00
5.100000E 02		8.000000E CO
5.400000E 02		8.000000E 00
5.700000E 02		8.000000E 00
6.00000CE 02		8.000000E 00
6.300000E 02		8.00000CE 00
6.600000E 02		8.000000E 00
6.900000E 02		8.000000E 00
7.200000E 02		B.000000E 00
7.500000E 02		8.000000E 00
7.600000E 02		8.000000E 00
8.1000COE 02		8.000000E 00
8.400000E 02	e s	8.000000E 00
B.700000E 02	? S	8.000000E 00
9.000000E 02	2 S	8.000000E 00
9.300000E 02		8.000000E 00

TIME		TYPE	VALUE	
0.0	~4	S	8.00000CE	00
3.000000E	01	s s	8.000000E	00
6.0000002	01		B.00000E	00
9.000000E	01	S	B.00000E	00
1.2000COE	02	S	a.000000E	00
1.500000E	02	Š	8.000000E	00
1.800000E	02	S	8.000000E	00
2.100000E	02	s	8.000000E	00
2.400000E	02	S	3000000E	00
2.700000E	02	S	8.00000E	00
3.000000E	02	S	8.000000E	00
3,300000E	02	S	8.00000E	00
3.600000E	02	S	8.000000E	00
3.900000E	02	S	8.00000E	00
4.200000E	02	S	8.C00000E	00
4,500000E	02	S	8.000000E	00
4.800000E	02	S	8.000000E	00
5.100000E	02	S	8.00000E	CO
5.40000CE	02	5	8.000000E	00
5.70000E	02	S	8.000000E	00
6.000000E	02	S	8.00000E	00
6.300000E	02	S	8.000000E	00
6,600000E	02	S	8.000000E	ÇO
6 900000E	02	S	8.C00000E	00
7.2000COE	02	Ş	8.000000E	00
7.500000E	02	\$ \$	8.000000E	00
7.800000E	02		8.000005	00
8.100000E	02	S	8.000000E	00
8.400000E	02	5	8.000000E	00
8.700000E	02	Ş	8.000000E	00
9.00000E	02	S	8.C00000E	00
9.30000E	02	S	8.000000E	00

TIME	TYPE	VALUE
0.0	S	4.000000E 00
3.000000E 0		4.000000E 00
6.0000COE 0		4.000000E 00
9.000000E 0		4.000000E 00
	2 5	4.00000E GO
	2 5	4.00000E 00
	2 5	4.000000E 00
)2 S	4.000000E 00
	2 5	4.000000E 00
)2 S	4.000000E 00
)2 S	4.000000E 00
	2 5	4.000000E 00
)2 S	4.000000E 00
5.400000E 0)2 S	4,000000E 00
5.7000GOE G	02 S	4.000000E 00
6.000000E 0	02 \$	4.000000E 00
6.300000E 0	2 5	4.000000E 00
6.600000E)2 S	4.000000E 00
6.900000E ()2 S	4.00000GE 00
7.200000E 0	D2 S	4.000000E 00
7.500000E ()2 S	4.000000E 00
7.600000E (02 S	4.000000E 00
8.100000E	02 S	4.000000E 00
8.400000E	12 S	4.000000E 00
8.700000E	D2 S	4.000000E 00
		4.000000E 00
9.300000E	02 S	4.000000E 00

TIME		TYPE	VALUE	
0.0		S	3.000000E	07
3.000000E	01	S	3.000000E	07
6.000000E	01	S	3.000000E	07
9.00000CE	01	S	3.00000E	07
1.200000E	02	S	3.000000E	07
1.5000008	02	S	3.000000E	07
1.8000005	02	S S S	3.000000E	07
2.100000E	02	S	3.000000E	07
2.40000CE	02	S	3.00000E	07
2.7000COE	02	S	3.000000E	07
3.0000COE	02	S	3.000000E	07
3.300000E	02	S	3.000000E	07
3.600000E	02	S	3.000000E	07
3.9000C0E	02	S	3.00000E	07
4.2000COE	02	S	3.00000E	07
4.500000E	02	S S S	3.000000E	07
4.800000E	02	S	3.000000E	07
5.100000E	02	S	3,00000E	07
5.400000E	02	S	3.000000E	07
5.700000E	02	S	3.00000E	07
6.000000E	02	S	3.C00000E	07
6.300000E	02	S	3.000000E	07
6.600000E	02	S	3.000000E	07
6.900000E	02	S	3.000000E	07
7.200000E	02	S	3.000000E	07
7.50000CE	02	S	3.000000E	07
7.800000E	02	S	3.000000E	07
8.100000E	02	S	3.00000E	07
B.400000E	02	S	3.000000E	07
8.700000E	02	S	3.000000E	07
9.000000E	02	S	3.0000COE	07
9.3000C0E	02	S	3.000000E	07

i = GI-1NIOd

000000000000000000000000000000000000000	2.7759270E 2.7762390E 2.7762390E 2.7762390E 2.7762390E 2.777777777777777777777777777777777777	# \$ # \$ # # # # # # # # # # # # # # # #	002 002 003 003 004 005 005 005 005 005 005 005 005 005	9.30000E 8.700000E 8.700000E 9.70000E 9.7000E 9.70000E 9.70000E 9.70000E 9.70000E 9.70000E 9.70000E 9.70000E 9.7
CS	2.837285E	S	05	3.000000.E
05	3180278.2	S	05	3.100000F.S
05	2.901902E 2.886216E	s s	05	1.500000E
20	3982919.5	Š	05	3000002.1
20		S	10	3000000.6
05	2.959980E	S	10	3000000.8
20	3649486.2	s	10	3.000000.£
20	3,000000.E	_S		0.0
	3UJ∆V	39YT		TIWE

TIME		TYPE	VALUE	
0.0		S	3.000000E	02
3.000000E	01		2.973813E	02
6.000000E	01	S S	2.927502E	02
9.000000E	01	S	2.884094E	02
1.200000E	02	S	2.844219E	02
1.500000E	02	S	2.807952E	G2
1.800000E	02		2.775146E	02
2.100000E	02	\$ \$	2.745569E	02
2.400000E	02	S	2.718955E	02
2.700000E	02		2.695042E	02
3.000000E	02	S S	2.673574E	02
3.300000E	02	S	2.654314E	02
3.6000C0E	02	S	2.637039E	02
3.900000E	02	S	2.621553E	02
4.200000E	02	S	2.607668E	02
4.500000E	02	S	2.595225E	02
4.800000E	02	S	2.53407CE	02
5.100000E	02	S	2.574070E	02
5.400000E	02	S	2.5€5105E	02
5.700000E	02	S	2.557069E	02
6.000000E	02	S	2.549862E	02
6.300000E	02	S	2.543399E	02
6.600000E	02	S	2.537601E	02
6.900000E	02	S	2.532400E	02
7.200000E	02	S	2.527734E	02
7.500000E	02	S	2.523547E	02
7.800000E	02	S	2.519789E	02
8.10000GE	02	S	2.516416E	02
8.400000E	02	Š	2.513388E	02
8.7000C0E	Ò2	S	2.510670E	02
9.00000CE	02	S	2.508229E	02
9.300000E	02	s	2.506038E	02

TIME 0.0 3.000000E 01 6.00000E 01 9.00000E 01 1.20000E 02 1.500000E 02 2.10000E 02 2.10000E 02 2.70000E 02 3.00000E 02 3.300000E 02 4.20000E 02 4.50000E 02 4.50000E 02 5.10000E 02 5.70000E 02 6.00000E 02	55555555	VALUE 3.000000E 2.942329E 2.847380E 2.767437E 2.698711E 2.638923E 2.586531E 2.540391E 2.499607E 2.463457E 2.431346E 2.377296E 2.335455E 2.334258E 2.316098E 2.299850E 2.285301E 2.272267E 2.260584E 2.250109E 2.24007146	02 02 02 02 02 02 02 02 02 02 02 02 02 0
5.700000E 02	5555555555555	2.260584E	02
6.000000E 02		2.250109E	02

TIME		TYPE	VALUE	
0.0		S	3.000000E 02	
3.000000E	01	S	2.939604E 02	
6.000000E	01	S	2.836946E 02	
3000000	01	S	2.746729E 02	
1.200000E	02	S	2.668035E 02	
1.500000E	02	S	2.599419E 02	
1.800000E	02	s	2.539440E 02	
2.100000E	02	Š	2.488829E 02	
2.40000CE	02	S S	2.440520E 02	
2.700000E	02	š	2.399628E 02	
3.000000E	02	Š	2.363418E 02	
3.300000E	02	Š	2.331275E 02	
3.600000E	02	č	2.302688E 02	
3.900000E	02	s s	2.277216E 02	
4.200000E	02		2.254489E 02	
4.500000E	02	3		
		5	2.234185E 02	
4.800000E	02	S S S S	2.216028E 02	
5.100000E	02	5	2.199780E 02	
5.400000E	02	S	2.185226E 02	
5.700000E	02	S	2.172187E 02	
6.000000E	02	s s	2.160496E 02	
6.300000E	02	S	2.150009E 02	
6.600000E	02	S	2.140601E 02	
6.900000E	02	S	2.132157E 02	
7.200000E	02	S	2.124576E 02	
7.500000E	02	S	2.117771E 02	
7.800000E	02	S	2.111658E 02	
8.100000E	02	S	2.106167E 02	
8.400000E	02	s s	2.101239E 02	
8.700000E	02	S	2.096810E 02	
9.000000E	02	S	2.092829E 02	
9.300000E	02	S	2.089254E 02	

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POINT-ID = 5

TIME		TYPE	VALUE	
0.0		S	3.000000E	02
3.000000E	01	S	2.984951E	02
6.000000E	01	S	2.959983E	02
9.0000COE	01	S	2.938445E	02
1.200000E	02	S	2.919236E	02
1.500000E	02	S	2.901902E	02
1.8000CGE	02	S	2.886216E	02
2.100000E	02	S	2.872031E	02
2.400000E	02	S	2.859224E	02
2.700000E	02	S	2.84767BE	02
3.000000E	02	S S	2.837288E	02
3.300000E	02	S	2.827944E	02
3.600000E	02	S	2.819551E	02
3.9000COE	02	S	2.812014E	02
4.2000COE	02	S	2.805254E	02
4.500000E	02	S	2.799189E	02
4.800000E	02	S	2.793750E	02
5.100000E	02	S	2.788875E	02
5.4000COE	02	S	2.784500E	02
5.7000COE	02	S	2.780579E	02
6.000000E	C2	S	2.777063E	02
6.300000E	02	S	2.773909E	02
6.600000E	02	S	2.771079E	02
6.90000E	02	S	2,768542E	02
7.200000E	02	S	2.766267E	02
7.500000E	02	S	2.764224E	02
7.80000GE	02	S	2.762390E	02
8.100000E	Q,Z	Ş	2.760745E	02
8.40000CE	02	S	2.759270E	02
8.7000C0E	02	S	2,757944E	02
9.00000E	02	5	2.756755E	02
9.300000E	02	S	2.755686E	02

TIME 0.0 3.000000E 6.000000E 9.000000E 1.200000E 1.500000E 2.100000E 2.400000E 2.700000E 3.0000000 3.3000000E	01 01 02 02 02 02 02 02 02 02	T Y S S S S S S S S S S S S S S S S S S	2.973813E 2.927502E 2.884094E 2.844219E 2.867952E 2.775149E 2.745571E 2.719958E 2.695044E 2.673574E	02 02 02 02 02 02 02 02 02 02 02
1.50000E 1.80000E 2.10000E 2.40000E 2.70000E 3.00000E	02 02 02 02 02 02	S S	2.807952E 2.775149E 2.775958E 2.695044E 2.673574E 2.637041E 2.637041E 2.637041E 2.637041E 2.5205E 2.554070E 2.554070E 2.554068E 2.5549662E 2.549862E 2.543399E 2.532400E 2.527734E 2.523547E 2.513387E 2.513387E 2.513387E 2.513387E 2.513387E 2.51369E 2.51369E	02 02 02 02 02 02

TIME	TYPE	VALUE
0.0	S	3.000000E 02
3.000000E 01	S	2.942332E 02
6.000000E 01	S	2.847383E 02
9.000000E 01	s	2.767437E 02
1.200000E 02	s	2.698711E 02
1.500000E 02	š	2.638926E 02
1.800000E 02	s	2.586531E 02
2.100000E 02	Š	2.540391E 02
2.400000E 02	š	2.499608E 02
2.700000E 02	š	2.463459E 02
3.000000E 02	Š	2.431346E 02
3.300000E 02	Š	2.402769E 02
3.6000000 02	Š	2.377297E 02
3.900000E 02	Š	2.354565E 02
4.20000CE 02	Š	2.334259E 02
4.500000E 02	Š	2.316100E 02
4.800000E 02	S	2.299851E 02
5.100000E 02	Š	2.285302E 02
5.400000E 02	s	2.272267E G2
5 700000E 02	Š	2.260585E 02
6.000000E 02	S	2.250110E 02
6.300000E 02	S	2.240714E 02
6.600000E 02	S	
6.900000E 02	s 5	2.232284E 02 2.224719E 02
7.200000E 02	S	
	3	2.217929E 02
7.500000E 02 7.800000E 02	S	2.211833E 02
	S	2.206358E 02
8.100000E 02	S	2.2014428 02
8.400000E 02	S	2.197028E 02
8.700000E 02	s	2.193062E 02
9.000000E 02	s	2.189499E 02
9.3000COE 02	S	2.186299E 02

TIME 0.0 3.000000E 0 6.000000E 0 9.00000E 0 1.20000E 0 1.500000E 0 2.10000E 0 2.40000E 0 3.00000E 0 3.00000E 0 3.300000E 0 3.300000E 0 3.90000E 0 4.50000E 0 4.50000E 0	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	VALUE 3.000000E 2.939607E 2.836948E 2.746731E 2.666037E 2.539441E 2.486830E 2.440520E 2.399627E 2.3634177E 2.302688E 2.277216E 2.254490E 2.234187E 2.216031E	02 02 02 02 02 02 02 02 02 02 02 02 02 0
5.40000E 0: 5.700000E 0: 6.00000E 0: 6.60000E 0: 6.60000E 0: 7.200000E 0: 7.50000E 0: 7.50000E 0: 8.10000E 0: 8.700000E 0: 9.00000E 0: 9.30000E 0:	2	2.185229E 2.172188E 2.160497E 2.150009E 2.140602E 2.132157E 2.117771E 2.117771E 2.111658E 2.106169E 2.101239E 2.096810E 2.092830E 2.092830E	02 02 02 02 02 02 02 02 02 02 02 02 02

TIME		TYPE	VALUE	
0.0		S	3.000000E	02
3.00000CE	01	S	2.984951E	02
6.00000E	01	S	2,959983E	02
9.000000E	01	S	2.938445E	02
1.2000COE	02	S	2.919236E	02
1.500000E	02	S	2.901902E	02
1.800000E	02	S	2.883216E	02
2.100000E	02	S	2.872031E	02
2.400000E	02	S	2.859224E	02
2.700000E	02	S	2.847678E	02
3.000000E	02	s s s	2.8372885	02
3.3000CCE	02	S	2.827944E	02
3.600000E	02	S	2.8195518	02
3.900000E	02	S	2.812014E	02
4.200000E	02	S	2.8052548	02
4.500000E	02	s	2.799189E	02
4.800000E	02	S	2.7937508	02
5.100000E	02	s	2.780875E	02
5.400000E	02	S	2.784500E	02
5.700000E	02	\$	2.780579E	02
6.00000E	02	Ş	2.777063E	02
6.300000E	02	S	2.773909E	02
6.600000E	02	\$	2.771079E	02
6.900000E	02	\$	2.768542E	02
7.20000E	02	5	2.766267E	02
7.500000E	02	S	2.764224E	02
7.50000CE	02	S	2.762390E	02
8.100000E	02	S	2.7607458	02
8.400000E	02	S	2.759270E	02
8.700000E	02	S	2.757944E	02
9.000000E	02	S	2.756755E	02
9.300000E	02	S	2.755686E	02

TIME O.O	TY	PE.	VALUE 3.000000E	02
	01	S S	2.934949E	02
	01	S	2.955980E	02
	01	S	2.938445E	02
	02	5	2.919236E	02
	02	S	2.901902E	02
	02	5	2.886216E	02
	02	\$ \$ \$	2.872031E	02
	02	s	2.859224E	02
	02	Š	2.847678E	02
3.000000E	02	S	2.837285E	02
3.300000E	02	S	2.827942E	02
3.6000005	02	S S	2.819548E	02
3.900000E	02	\$	2.8120145	02
	02	S	2.805254E	02
	02	S	2.799189E	02
	02	S	2.793750E	02
	02	5	2.788372E	02
	02	S	2.764500E	02
	02	S	2.780579E	02
	02	S	2.777063E	02
	02	S	2.773909E	02
	02	S S	2.771079E	02
	02	5	2.768542E	02
	02 02	S S	2.766267E	02 02
	02	S	2.764224E	02
	02	S	2.762390E 2.760745E	02
	02	S	2.759270E	02
	02	5	2.757944E	02
	02	\$	2.756755E	02
	02	S	2.755686E	02
J. J	-	•	2.,550005	U.

POINT-ID = 100

TIME	TYPE	VALUE	_
0.0	S	3.00000E 0	
3.000000E 01	S	2.99993E 0	
6,000000E 01	ş	2.999995E O	
9.000000E 01		2.99993E 0	_
1.200000E 02		2.999988E 0	
1.500000E 02		2.99990E 0	
1.600000E 02	. S	2.999988E 0	
2.100000E 02	! S	2.999988E 0	
2.400000E 02	: S	2.999988E 0	
2.700000E 03		2.999988E 0	
3.000000E 02	? S	2.999988E 0	
3.300000E 02		2.999385E 0	
3.600000E 02		2.999980E 0	
3.900000E 02		2.999985E 0	
4.200000E 02	? S	2.999980E 0	
4.500000E 02		2.999985E O	
4.8000COE 02		2.999980E 0	
5.100000E 02		2.999983E C	
5.4000GOE 02	2 5	2.999983E 0	
5.700000E 02		2,999980E 0	
6.00000E 0		2.999983E 0	
6.300000E 02			2
6.6000COE 0			2
6.900000E 02			2
7.200000E 0			2
7.500000E 02			2
7.500000E Q			2
8.100000E 0			2
8.400000E 0			2
8.700000E 0			2
9.000000E 0			2
9.300000E 0	2 S	2.999980E 0	2

XY-OUTPUT SUMMARY

SUBCASE RESPONSE

DISPLACEMENT CUEVE

1(3)

CURVE TITLE =

X-AXIS TITLE =TIME IN SECONDS

Y-AXIS TITLE = DEGREES CELSIUS GP(100,1,4)

THE FOLLOWING INFORMATION IS FOR THE ABOVE DEFINED CURVE ONLY.

WITHIN THE FRAME X-LIMITS (X = 0.0 TO X = 0.93000000E 03)

THE SMALLEST Y-VALUE = 0.2755686E 03 AT X = 0.9300000E 03

THE LARGEST Y-VALUE = 0.3000000E 03 AT X = 0.0

WITHIN THE X-LIMITS OF ALL DATA (X = 0.0

TO X = 0.9300000E 03

THE SMALLEST Y-VALUE = 0.2755686E 03 AT X = 0.9300000E 03

THE LARGEST Y-VALUE = 0.3000000E 03 AT X = 0.0

XY-OUTPUT SUMMARY

SUBCASE RESPONSE

DISPLACEMENT CUEVE

4(3)

CURVE TITLE =

X-AXIS TITLE =TIME IN SECONDS

Y-AXIS TITLE = DEGFEES CELSIUS GP(100.1.4)

THE FOLLOWING INFORMATION IS FOR THE ABOVE DEFINED CURVE ONLY.

WITHIN THE FRAME X-LIMITS

(X = 0.0

TO X = 0.9300000E 03)

THE SMALLEST Y-VALUE = 0.2089254E 03 AT X = 0.9300000E 03

THE LARGEST Y-VALUE = 0.3000000E 03 AT X = 0.0

WITHIN THE X-LIMITS OF ALL DATA (X = 0.0 TO X = 0.93000000 = 0.3)

THE SMALLEST Y-VALUE = 0.2089254E 03 AT X = 0.9300000E 03

THE LARGEST Y-VALUE = 0.3000000E 03 AT X = 0.0

SUBCASE RESPONSE

DISPLACEMENT CUFVE

100(3)

CURVE TITLE = . X-AXIS TITLE =TIME IN SECONDS

Y-AXIS TITLE DEGREES CELSIUS GP(100,1,4)

THE FOLLOWING INFORMATION IS FOR THE ABOVE DEFINED CURVE ONLY.

WITHIN THE FRAME X-LIMITS

(X = 0.0

TO X = 0.9300000E 03)

THE SMALLEST Y-VALUE = 0.2999980E 03 AT X = 0.3600000E 03

THE LARGEST Y-VALUE = 0.30000000E 03 AT X = 0.0

WITHIN THE X-LIMI'S OF ALL DATA (X = 0.0 TO X = 0.9300000E 03)

THE SMALLEST Y-VALUE = 0.2995980E 03 AT X = 0.3600000E 03

THE LARGEST Y-VALUE = $0.30000000E \ O3 \ AT \ X = 0.0$

XY-OUTPUT SUMMARY

SUBCASE RESPONSE

VELOCITY

CUPVE 100(3)

CURVE TITLE =

X-AXIS TITLE =TIME IN SECONDS

Y-AXIS TITLE = DEGREES CELSIUS PER SECOND GP(100,1,4)

THE FOLLOWING INFORMATION IS FOR THE ABOVE DEFINED CURVE ONLY.

WITHIN THE FRAME X-LIMITS (X = 0.0 TO X = 0.9300000E 03)

THE SMALLEST Y-VALUE = -0.2441405E-04 AT X = 0.0

THE LARGEST Y-VALUE = 0.1627604E-04 AT X = 0.3600000E 03

WITHIN THE X-LIMITS OF ALL DATA (X = 0.0

TO X = 0.9300000E 03)

THE SMALLEST Y-VALUE = -0.2441405E-04 AT X = 0.0

THE LARGEST Y-VALUE = 0.1627604E-04 AT X = 0.3600000E 03

XY-OUTPUT SUMMARY

SUBCASE RESPONSE

VELOCITY

CUFVE

1(3)

XY-PAIRS WITHIN FRAME LIMITS WILL BE PLOTTED PENSIZE = 1

THIS IS CURVE 1 OF WHOLE FRAME 1

CURVE TITLE =

X-AXIS TITLE =TIME IN SECONDS

Y-AXIS TITLE = DEGREES CELSIUS PER SECOND GP(100.1.4)

Y. . .

THE FOLLOWING INFORMATION IS FOR THE ABOVE DEFINED CURVE ONLY.

WITHIN THE FRAME X-LIMITS

(X = 0.0)

TO X = 0.9300000E 03)

THE SMALLEST Y-VALUE = -0.8322752E-01 AT X = 0.3000000E 02

THE LARGEST Y-VALUE = -0.3198242E-02 AT X = 0.9300000E 03

WITHIN THE X-LIMITS OF ALL DATA (X = 0.0

TO X = 0.9300000E 03)

THE SMALLEST Y-VALUE = -0.8322752E-01 AT X = 0.3000000E 02

THE LARGEST Y-VALUE = -0.3198242E-02 AT X = 0.9300000E 03

PAGE

XY-OUTPUT SUMMARY

SUBCASE RESPONSE

VELOCITY

CUPVE

4(3)

XY-PAIRS WITHIN FRAME LIMITS WILL BE PLOTTED

PENSIZE = 1

THIS IS CURVE 1 OF WHOLE FRAME 2

CURVE TITLE =

X-AXIS TITLE =TIME IN SECONDS

Y-AXIS TITLE = DEGREES CELSIUS PER SECOND GP(100.1.4)

THE FOLLOWING INFORMATION IS FOR THE ABOVE DEFINED CURVE ONLY.

WITHIN THE FRAME X-LIMITS (X = 0.0

TO X = 0.9300000E 03)

THE SMALLEST Y-VALUE - -0.3421956E 00 AT X = 0.3000000E 02

THE LARGEST Y-VALUE = -0.1071116E-01 AT X = 0.9300000E 03

WITHIN THE X-LIMITS OF ALL DATA (X = 0.0 TO X = 0.9300000E 03)

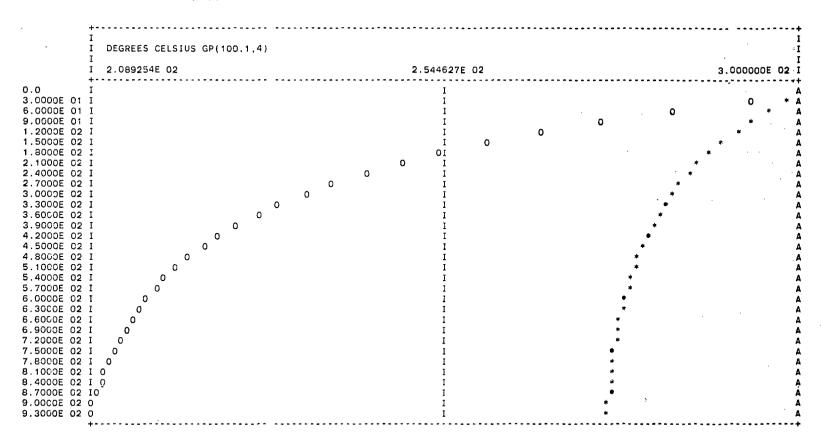
THE SMALLEST Y-VALUE = -0.3421956E CO AT X = 0.3000000E 02

THE LARGEST Y-VALUE = -0.1071116E-01 AT X = 0.9300000E 03

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PAGE

F R A M E



i I	DEGREES CELSIUS PER SECOND GP(100.1.4	· · · · · · · · · · · · · · · · · · ·		I I
I I	-2.441405E-05	-4.	.069007E-06	1.627604E-05 I
0.0 *			I	ī
3.0000E 01 I			I	*
6.0000E 01 I	•	*	1	I
9.0000E 01 I	*		I	I
1.2000E 02 I			I	* I
1.5000E 02 I		*	I	1
1.8000E 02 I			I *	Ţ
2.1000E 02 I			1 *	1
2.4000E 02 I				Ī
2.7000E 02 I			1 · · · ·	<u> </u>
3.0000E 02 I		•	1	1
3.3000E 02 I			‡.	1
3.6000E 02 I			i T	•
3.9000E 02 I			1	
4.2000E 02 I			T	•
4.5000E 02 I			1 T	*
4.8000E 02 I 5.1000E 02 I				Ť
5.4000E 02 I			T "	÷
5.7000E 02 I		-	7	* 7
6.0000E 02 I		. *	1	Ť
6.3000E 02 I			Ī	* 1
6.6000E 02 I		*	Ť	Ī
6.9000E 02 I			Ī	* Î
7.2000E-02 I		*	Ī	Ī
7.5000E 02 I			Ī	•
7.8000E 02 I		*	Ī	Ī
8.1000E 02 I			Ī	* Ī
.8.4000E 02 I		*	1	I
8.7000E 02 I			I	* 1
9.0000E 02 I		*	I	I
9.3000E 02 I			1	• 1
	La			

F R A M E

I DEGREES CELSIUS PER SECO	DEGREES CELSIUS PER SECOND GP(100.1,4)		
I -8.322752E-02		-4.321289E-02	-3.198242E-03
1		* I	·
1.0000E 01 * 5.0000E 01 I		I	
0.0000E 01 I	*	Ī	
.2000E 02 I	*	I .	
.5000E 02 I .8000E 02 I	•	τ I	
1.1000E 02 I		I.*	
.4000E 02 1		Ĭ *	
.7000E 02 I		I *	
0.0000E 02 I 0.3000E 02 I		I #	
1.6000E 02 I		i ·	*
3.90COE 02 I		I	*
.2000E 02 I		I .	*
1.50005 02 I 1.8000E 02 I		1	•
1.000E 02 I		Î	•
3.40GOE 02 I		I	*
.7000E G2 I		į	* _
0.0000E 02 I 0.3000E 02 I		Ţ	•
6.6000E 02 I		Ī	•
3.9000E 02 I		I	•
7.2000E 02 I		Ţ	*
7.5000E 02 ! 7.8000E 02 !		Ĭ	*
1.1000E 02 I		î	*
.4000E 02 I		Ī	•
1.7000E 02 I		I	
0.0000E 02 I 0.3000E 02 I		1	

F R A M E

I I	1 DEGREES CELSIUS PER SECOND GP(100.1.4)				
I I	-3.421956E-01	-1.764534E-01	-1.071116E-0		
0.0		* I			
3.0000E 01 *		1			
6.0000E 01 I	*	I			
9.0000E 01 I		1			
1.2000E 02 I		1			
1,5000E 02 I		* I			
1.8000E 02 I		* -			
2.1000E 02 I		<u> </u>	•		
2.4000E 02 1		*			
2.7000E 02 1		*			
3,0000E 02 1			•		
3.3000E 02		* .			
3.6000E 02 1		1			
3.9000E 02		1	_		
4.2000E 02		1	•		
4.5000E 02 1		1	•		
4.8000E 02 1		1	*		
5.1000E 02		1 7	7.		
5.40COE 02 1		1	, , , , , , , , , , , , , , , , , , ,		
5.7000E 02		1			
6.0000E 02 1		l T			
6.3000E 02		i T			
6.6000E 02		, T			
6.9000E 02		<u>.</u> Т	•		
7.2000E 02 3		1	*		
7.8000E 02 .		1	*		
8.1000E 02		1			
8.4000E 02		1			
8.7000E 02		Ť			
9.00COE 02		Ī			
9.3000E 02		T			
5.3000E 02	1	•			

```
NASTRAN LOADED AT LOCATION 12CF20
TIME TO GO = 59 CPU SEC., 299 I/O SEC.
     O CPU-SEC.
                        O ELAPSED-SEC.
                                            SEM1
                                                  BEGN
     O CPU-SEC.
                        C ELAPSED-SEC.
                                            SEMT
     1 CPU-SEC.
                        7 ELAPSED-SEC.
                                            NAST
     1 CPU-SEC.
                        8 ELAPSED-SEC.
                                            GNFI
     1 CPU-SEC.
                        B ELAPSED-SEC.
                                            XCSA
     1 CPU-SEC.
                        9 ELAPSED-SEC.
                                            IFP1
     1 CPU-SEC.
                       13 ELAPSED-SEC.
                                            XSOR
                                              DO IFP
     2 CPU-SEC.
                       19 ELAPSED-SEC.
     3 CPU-SEC.
                       31 ELAPSED-SEC.
                                             END
                                                  İFP
     3 CPU-SEC.
                       31 ELAPSED-SEC.
                                            XGPI
     4 CPU-SEC.
                       37 ELAPSED-SEC.
                                            SEM1
                                                  END
     4 CPU-SEC.
                       37 ELAPSED-SEC.
                                                  LINKNSO2 ---
    23 I/O SEC.
LAST LINK DID NOT USE 40016 BYTES OF OPEN CORE
     4 CPU-SEC.
                       39 FLAPSED-SEC.
                                             - - - -
                                                  LINK END ---
     4 CPU-SEC.
                       39 ELAPSED-SEC.
                                            XSFA
     5 CRU-SEC.
                       40 ELAPSED-SEC.
                                            XSFA
                                                   GP1
                                                           BEGN
     5 CPU-SEC.
                       40 ELAPSED-SEC.
                                             3
                                                   GP1
                                                           END
     5 CPU-SEC.
                       44 ELAPSED-SEC.
                                             3
     5 CPU-SEC.
                                                   GP<sub>2</sub>
                                                           BEGN

✓5 ELAPSED-SEC.

                                            8
                                                           END
     5 CPU-SEC.
                       46 ELAPSED-SEC.
                                            8
                                                   GP2
    5 CPU-SEC.
                       46 ELAPSED-SEC.
                                             10
                                                   PLTSET
                                                           BEGN
                                                   PLTSET
     5 CPU-SEC.
                       47 ELAPSED-SEC.
                                             10
                                                           END
     5 CPU-SEC.
                       47 ELAPSED-SEC.
                                             12
                                                   PRIMSG
                                                           BEGN
     5 CPU-SEC.
                       4B ELAPSED-SEC.
                                            12
                                                   PRIMSG
                                                           END
     5 CPU-SEC.
                       48 ELAPSED-SEC.
                                            1.3
                                                   SETVAL
                                                           BEGN
     5 CPU-SEC.
                       48 ELAPSED-SEC.
                                            13
                                                   SETVAL
                                                           END
     5 CPU-SEC.
                       49 ELAPSED-SEC.
                                            21
                                                   GP3
                                                           EFGN
                                                   GP3
                                                           END
     5 CPU-SEC.
                       55 ELAPSED-SEC.
                                             21
     5 CPU-SEC.
                       55 ELAPSED-SEC.
                                                   TA1
                                                           BEGN
     5 CPU-SEC.
                       63 ELAPSED-SEC.
                                                   TA1
                                                           END
     5 CPU-SEC.
                       64 ELAPSED-SEC.
                                                   LINKNSO3 ---
    54 1/0 SEC.
LAST LINK DID NOT USE 82788 BYTES OF OPEN CORE
     5 CPU-SEC.
                       67 ELAPSED-SEC.
                                            ----
                                                   LINK END ---
     5 CPU-SEC.
                       67 ELAPSED-SEC.
                                             27
                                                   SMA1
                                                           BEGN
                                                   SMA1
                                                           END
     5 CPU-SEC.
                       70 ELAPSED-SEC.
                                            27
     5 CPU-SEC.
                       TO ELAPSED-SEC.
                                             30
                                                   SMA2
                                                           BEGN
                                             30
                                                   SMA2
                                                           END
     6 CPU-SEC.
                       T3 ELAPSED-SEC.
                       "4 ELAPSED-SEC.
                                                   LINKNSO5 ---
     6 CPU-SEC.
    62 I/O SEC.
LAST LINK DID NOT USE 64268 BYTES OF OPEN CORE
                                             ---- LINK END - -
     6 CPU-SEC.
                       77 ELAPSED-SEC.
                       77 ELAPSED-SEC.
                                             35
                                                   RMG
                                                           BEGN
     6 CPU-SEC.
     6 CPU-SEC.
                       NO ELAPSED-SEC.
                                            SDCO
                                                  MP
     6 CPU-SEC.
                       30 ELAPSED-SEC.
                                             SDCO
                                                  MP
     6 CPU-SEC.
                                            FES
                       81 ELAPSED-SEC.
     6 CPU-SEC.
                       83 ELAPSED-SEC.
                                             FBS
     6 CPU-SEC.
                       84 ELAPSED-SEC.
                                            MPYA D
                                                   METHOD 2 NT. NBR PASSES = 1.EST. TIME =
                                                                                                    0.0
     6 CPU-SEC.
                       85 ELAPSED-SEC.
                                            MPYA D
     6 CPU-SEC.
                       86 ELAPSED-SEC.
                                            TRAN POSE
                                            TRAN POSE
     6 CPU-SEC.
                       87 ELAPSED-SEC.
                                            MPYA D
```

6 CPU-SEC.

87 ELAPSED-SEC.

11 CPU-SEC.

147 ELAPSED-SEC.

```
METHOD 2 NT, NBR PASSES = 1.EST. TIME &
                                                                                                0.0
    6 CPU-SEC.
                      88 ELAPSED-SEC.
                                          MPVA
                                                D
                      91 ELAPSED-SEC.
                                           35
                                                 RMG
                                                         END
     6 CPU-SEC.
                      92 ELAPSED-SEC.
                                                LINKNSO4 ---
    7 CPU-SEC.
                                           ----
    78 I/O SEC.
LAST LINK DID NOT USE 72520 BYTES OF OPEN CORE
                      S6 ELAPSED-SEC.
                                          ---- LINK END ---
     7 CPU-SEC.
     7 CPU-SEC.
                                                 GP4
                                                         EEGN
                      96 ELAPSED-SEC.
                                           40
     7 CPU-SEC.
                      9 ELAPSED-SEC.
                                           40
                                                 GP4
                                                         END
                                           46
                                                 GPSP
                                                         BEGN
                     :(O ELAPSED-SEC.
     7 CPU-SEC.
                                                 GPSP
                                                         END
     7 CPU-SEC.
                     101 ELAPSED-SEC.
                                           46
                                                LINKNS14 ---
     7 CPU-SEC.
                     101 ELAPSED-SEC.
                                           ----
    86 I/O SEC.
LAST LINK DID NOT USE 117044 BYTES OF OPEN CORE
                     105 ELAPSED-SEC.
                                          ---- LINK END ---
     7 CPU-SEC.
                                           47
                                                 OFP
                                                         BEGN
     7 CPU-SEC.
                     105 ELAPSED-SEC.
     7 CPU-SEC.
                     105 ELAPSED-SEC.
                                           47
                                                 OFP
                                                         END
                     106 ELAPSED-SEC.
                                                LINKNSO4 ---
     7 CPU-SEC.
    90 I/O SEC.
LAST LINK DID NOT USE 115564 BYTES OF OPEN CORE
                                           ---- LINK END ---
     7 CPU-SEC.
                     109 ELAPSED-SEC.
                     109 ELAPSED-SEC.
                                           51
                                                 MCE1
                                                         BEGN
     7 CPU-SEC.
     7 CPU-SEC.
                                                 MCE1
                                                         END
                     112 ELAPSED-SEC.
                                           51
     7 CPU-SEC.
                     113 ELAPSED-SEC.
                                           53
                                                 MCE2
                                                         BEGN
                     116 ELAPSED-SEC.
                                           MPYA
                                                D
     7 CPU-SEC.
                                                 METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                0.0
     7 CPU-SEC.
                     117 ELAPSED-SEC.
                                           MPYA
                                           MPYA
     8 CPU-SEC.
                     117 FLAPSED-SEC.
                                                 METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                                0.0
                                           MPYA
                                                 D
     8 CPU-SEC.
                     1:8 ELAPSED-SEC.
     8 CPU-SEC.
                      !'8 ELAPSED-SEC.
                                           MPYA
                                                 METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                                0.0
     a CPU-SEC.
                      120 ELAPSED-SEC.
                                           MPYA D
                                           MPYA
     8 CPU-SEC.
                      122 ELAPSED-SEC.
                                                 METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                0.0
     9 CPU-SEC.
                      124 ELAPSED-SEC.
                                           MPYA D
     9 CPU-SEC.
                      124 ELAPSED-SEC.
                                           MPYA
                                                 METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                                 0.0
     9 CPU-SEC.
                      126 ELAPSED-SEC.
                                           MPYA D
     9 CPU-SEC.
                      126 ELAPSED-SEC.
                                           MPYA D
                                                  METHOD 2 T , NBR PASSES = 1, EST. TIME =
                                                                                                 0.0
                                           MPYA D
     9 CPU-SEC.
                      127 ELAPSED-SEC.
                      129 ELAPSED-SEC.
                                           MPYA
     9 CPU-SEC.
                                                  METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                 0.0
     S CPU-SEC.
                      131 ELAPSED-SEC.
                                            MPYA
                                                 D
     10 CPU-SEC.
                      131 ELAPSED-SEC.
                                           MPYA
                                                 METHOD 2 T , NBR PASSES =
                                                                             1.EST. TIME =
                                                                                                 0.0
                                            MPYA D
     10 CPU-SEC.
                      133 ELAPSED-SEC.
     10 CPU-SEC.
                      133 ELAPSED-SEC.
                                            MPYA
                                                 D
                                                  METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                                 0.0
                                            MPYA D
     10 CPU-SEC.
                      134 ELAPSED-SEC.
                      135 ELAPSED-SEC.
     10 CPU-SEC.
                                            53
                                                  MCE2
                                                          END
     10 CPU-SEC.
                      137 ELAPSED-SEC.
                                            XSFA
                      137 ELAPSED-SEC.
    10 CPU-SEC.
                                            XSFA
     10 CPU-SEC.
                      137 ELAPSED-SEC.
                                            ----
                                                  LINKNSO6 ---
    112 I/O SEC'.
LAST LINK DID NOT USE 102132 BYTES OF OPEN CORE
     11 CPU-SEC.
                      139 ELAPSED-SEC.
                                            . . . -
                                                 LINK END ---
     11 CPU-SEC.
                                            75
                                                  DPD
                                                          BEGN
                      139 ELAPSED-SEC.
                                                  DPD
                                            75
                                                          END
     11 CPU-SEC.
                      143 ELAPSED-SEC.
                                                  LINKNS10 ---
     11 CPU-SEC.
                      145 ELAPSED-SEC.
    121 I/O SEC.
 LAST LINK DID NOT USE 116416 BYTES OF OPEN CORE
                                         ---- LINK END ---
```

```
11 CPU-SEC.
                      147 ELAPSED-SEC.
                                           81
                                                 MTRXIN
                                                         BEGN
    11 CPU-SEC.
                      148 ELAPSED-SEC.
                                                 MTRXIN
                                                         END
                                           81
    11 CPU-SEC.
                                                 PARAM
                      148 ELAPSED-SEC.
                                           83
                                                          BEGN
    11 CPU-SEC.
                      149 ELAPSED-SEC.
                                                 PARAM
                                                         END
                                           83
    11 CPU-SEC.
                      150 ELAPSED-SEC.
                                           XSFA
    11 CPU-SEC.
                      150 ELAPSED-SEC.
                                           XSFA
    11 CPU-SEC.
                     150 ELAPSED-SEC.
                                           88
                                                 GKAD
                                                          BEGN
    11 CPU-SEC.
                      152 ELAPSED-SEC.
                                           83
                                                 GKAD
                                                          END
    11 CPU-SEC.
                      153 ELAPSED-SEC.
                                                 LINKNSO5 ---
                                           ----
   128 I/O SEC.
LAST LINK DID NOT USE 117064 BYTES OF OPEN CORE
    11 CPU-SEC.
                     155 ELAPSED-SEC.
                                           ---- LINK END ---
    11 CPU-SEC.
                      155 ELAPSED-SEC.
                                           92
                                                 TRLG
                                                         BEGN
    12 CPU-SEC.
                     162 ELAPSED-SEC.
                                           MPYA
                                                 METHOD 2 T .NER PASSES = 1.EST. TIME =
                                                                                                 0.0
    12 CPU-SEC.
                      163 ELAPSED-SEC.
                                           MPYA D
    12 CPU-SEC.
                      165 ELAPSED-SEC.
                                           MPYA
                                                 METHOD 2 NT.NBR PASSES =
                                                                             1.EST. TIME =
                                                                                                 0.0
    12 CPU-SEC.
                      166 ELAPSED-SEC.
                                           MPYA
    12 CPU-SEC.
                      166 ELAPSED-SEC.
                                           MPYA
                                                 METHOD 2 NT.NBR PASSES =
                                                                             1.EST. TIME =
                                                                                                 0.0
    12 CPU-SEC.
                      168 ELAPSED-SEC.
                                           MPYA
    13 CPU-SEC.
                      168 ELAPSED-SEC.
                                           MPYA
                                                 METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                 0.0
    13 CPU-SEC.
                      169 ELAPSED-SEC.
                                           MPYA D
    13 CPU-SEC.
                      169 ELAPSED-SEC.
                                           92
                                                 TRLG
                                                         END
    13 CPU-SEC.
                      170 ELAPSED-SEC.
                                                 LINKNS11 ---
   142 I/O SEC.
LAST LINK DID NOT USE 58172 BYTES OF OPEN CORE
    13 CPU-SEC.
                     1 '3 ELAPSED-SEC.
                                           ---- LINK END ---
    13 CPU-SEC.
                      1"3 ELAPSED-SEC.
                                           97
                                                 TRHT
                                                         BEGN
    13 CPU-SEC.
                      175 ELAPSED-SEC.
                                           DECO MP
    13 CPU-SEC.
                     176 ELAPSED-SEC.
                                           DECO
                                                MP
    14 CFU-SEC.
                      209 ELAPSED-SEC.
                                                 TRHT
                                                         END
                                           97
    14 CPU-SEC.
                                                 LINKNS12 ---
                     209 ELAPSED-SEC.
   189 I/O SEC.
LAST LINK DID NOT USE 69268 BYTES OF OPEN CORE
    14 CPU-SEC.
                      215 ELAFSED-SEC.
                                                 LINK END ---
    14 CPU-SEC.
                      215 ELAPSED-SEC.
                                           99
                                                 VDR
                                                         BEGN
    14 CPU-SEC.
                      216 ELAPSED-SEC.
                                           99
                                                 VDR
                                                          FND
    15 CPU-SEC.
                      217 ELAPSED-SEC.
                                                 PARAM
                                                         BEGN
                                           111
    15 CPU-SEC.
                      217 ELAPSED-SEC.
                                           111
                                                 PARAM
                                                         END
    15 CPU-SEC.
                      218 ELAPSED-SEC.
                                           XSFA
    15 CPU-SEC.
                      218 ELAPSED-SEC.
                                           XSFA
    15 CPU-SEC.
                      218 ELAPSED-SEC.
                                           115
                                                 SDR1
                                                         BEGN
    15 CPU-SEC.
                                           MPYA
                      219 ELAPSED-SEC.
                                                 D
                                                 METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                 0.0
    15 CPU-SEC.
                      220 ELAPSED-SEC.
                                           MPYA D
    15 CPU-SEC.
                      222 ELAPSED-SEC.
                                                 SDR1
                                           115
    15 CPU-SEC.
                                                 LINKNSOB ---
                      223 ELAPSED-SEC.
   196 I/O SEC.
LAST LINK DID NOT USE 119104 BYTES OF OPEN CORE
    15 CPU-SEC.
                      226 ELAPSED-SEC.
                                           ---- LINK END ---
    15 CPU-SEC.
                                           118 PLTTRAN BEGN
                      226 ELAPSED-SEC.
    15 CPU-SEC.
                      227 ELAPSED-SEC.
                                           118
                                               PLTTRAN END
    15 CPU-SEC.
                      228 ELAPSED-SEC.
                                           ---- LINKNS13 ---
   200 I/O SEC.
LAST LINK DID NOT USE 114512 BYTES OF OPEN CORE
                                           ---- LINK END ---
    16 CPU-SEC.
                      231 ELAPSED-SEC.
    16 CPU-SEC.
                      231 ELAPSED-SEC.
                                           120
                                                 SDR2
                                                         BEGN
    16 CPU-SEC.
                      238 ELAPSED-SEC.
                                           120
                                                 SDR2
                                                         END
    16 CPU-SEC.
                      238 ELAPSED-SEC.
                                           ---- LINKNS14 ---
   208 I/O SEC.
```

LAST LINK DID NOT USE 66428 BYTES OF OPEN CORE

```
16 CPU-SEC.
                     246 ELAPSED-SEC.
                                          ---- LINK END ---
                                         121 SDR3 BEGN
121 SDR3 END
123 OFP BEGN
                     246 ELAPSED-SEC.
    16 CPU-SEC.
    16 CPU-SEC.
                     257 ELAPSED-SEC.
                     257 ELAPSED-SEC.
    16 CPU-SEC.
                                          123 OFP
                     262 ELAPSED-SEC.
                                                        END
    17 CPU-SEC.
                                          130 XYTRAN BEGN
    17 CPU-SEC.
                     262 ELAPSED-SEC.
                                          130 XYTRAN END
    20 CPU-SEC.
                     276 ELAPSED-SEC.
                                          ---- LINKNSO2 ---
    20 CPU-SEC.
                     276 ELAPSED-SEC.
   225 I/O SEC.
                            O BYTES OF OPEN CORE
LAST LINK DID NOT USE
    20 CPU-SEC.
                     291 ELAPSED-SEC.
                                         ---- LINK END ---
                                          132 XYPLOT BEGN
    20 CPU-SEC.
                     291 ELAPSED-SEC.
    20 CPU-SEC.
                     292 ELAPSED-SEC.
                                         132 XYPLOT END
    20 CPU-SEC.
                     292 ELAPSED-SEC.
                                          138 EXIT BEGN
= 227 I/O SEC.
LAST LINK DID NOT USE 97232 BYTES OF OPEN CORE
```

AMOUNT OF OPEN CORE NOT USED = OK BYTES

MINIMUM CARGO IMMUNISMAS

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IBM 360-370 SERIES

LEVEL 15.5.3

RIGID FORMAT SERIES M

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MODELS 91.95

SYSTEM GENERATION DATE - 12/31/74

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MMGMGP-9577G GORSTARG AND STATE OF THE STATE

MMRANI PARARITAN JANGARASI BARMANIAN - - MARLAMAN MMM68696697MMMMM6418787M4 - - - COMMISMON MEDIAN PROPERTY MANAGEMENT AND A PROPERTY OF THE PROPERTY OF T

- INDESCRIPTION OF THE PROPERTY OF THE PROPERT

MIGNESMAMM - - MONUMESTA VANCAGE FANCES ASSESSA MATERIALISMA MARKINAMARAMANA

MORNOGRAMACION DE L'ALTRE DE L'AL MM = - MC TO DESCRIPTION OF THE PROPERTY OF TH

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MMMARAMMINIA MARANA MAR

PAGE

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$
ID CLASS PROBLEM FOUR, C.E. JACKSON
S MAXIMUM CPU TIME ALLOWED FOR THE JOB
$
TIME 10
$
$ THE THERMAL ANALYZER PORTION OF NASTRAN IS TO BE USED
APP HEAT
$ THE NON-LINEAR TRANSIENT SOLUTION ALGORITHM IS TO BE USED
SOL 9
$ REQUEST FOR DIAGNOSTIC WHICH PRINTS OUT CONVERGENCE CRITERIA
$ PRODUCES OUTPUT ONLY FOR SOL 3
5
DIAG 18
$ REQUEST FOR DIAGNOSTIC FRINTOUT WHICH LISTS THE RIGID FORMAT BEING EXECUTED
$ (IN THIS CASE, SOL 9). THE INCLUSION OF THIS CARD IS OPTIONAL.
DIAG 14
$ THE RIGID FORMAT IS BEING ALTERED TO PROVIDE TRANSIENT OUTPUT
$ SORTED BY TIME STEP RATHER THAN BY GRID POINT. COMPARE THE OUTPUT WITH PROBLEM
$ 3 TO SEE THE DIFFERENCE. THIS ALTER PLUS THE DIAG 14 ADDITION ARE THE ONLY
$ CHANGES FROM PROBLEM 3 MADE IN EXECUTIVE CONTROL. THE ONLY OTHER
$ CHANGE WAS MADE TO THE TSTEP CARD IN THE BULK DATA.
$
ALTER 122
OFP HOPP1, HOOP1, HOUPV1, HOES1, HOEF1, //V, N, HCARDNO $
JUMP HP2
ENDALTER
CEND
```

CASE CONTROL DECK ECHO

```
CARD
COUNT
 1
 2
        $ END OF EXECUTIVE CONTROL --- START CASE CONTROL *****************************
        TITLE: NON-LINEAR TRANSIENT PROBLEM ... SORT1 OUTPUT FORMAT
 Ω
        S SPECIFY 51 LINES OF DATA PER PAGE (DOES NOT INCLUDE HEADINGS AT TOP OF PAGE)
 q
        $
10
        LINE=51
11
        $ REQUEST SORTED AND UNSORTED OUTPUT
12
13
        $ IF THIS CARD IS OMITTED. ONLY THE SORTED BULK DATA WILL APPEAR
14
15
        ECHO=BOTH
16
17
        S SELECT THE MPC AND LOAD SETS TO BE USED IN THIS SOLUTION
18
        S NOTE THAT NO SPC SET IS SELECTED. AND THAT DLOAD HAS REPLACED LOAD.
19
20
        MPC = 200
21
        DIO40=300
22
23
        S SELECT THE TEMPERATURE SET WHICH IS AN ESTIMATE OF THE FINAL SOLUTION VECTOR
        S THE SELECTION OF THIS SET IS OPTIONAL FOR SOL 9. BUT SHOULD BE MADE IF
25
        S THE FINAL TEMPERATURE IS SEVERAL HUNDRED DEGREES DIFFERENT FROM THE
26
        5 IC VECTOR, AND RADIATIVE INTERCHANGES ARE INCLUDED.
27
28
        TEMPIMATERIAL)=400
29
30
        5 SELECT THE STEP SIZE. NUMBER OF INCREMENTS, AND PRINTOUT FREQUENCY
31
32
        TSTEP=500
33.
        $ SELECT THE TEMPERATURE SET DEFINING THE TEMPERATURE VECTOR AT T=0.
34
35
        $
36
        IC=600
37
38
        $ SELECT OUTPUT DESIRED
39
        S
40
        OUTPUT
41
        THERMAL=ALL
42
        S DEFINE A GROUP OF GRID POINTS TO BE REFERENCED BY AN OUTPUT REQUEST
43
44
45
        SET 5 = 1,2,3,4,5,6,7,8,100
45
47
        $ REFERENCE A PREVIOUSLY DEFINED GROUP OF GRID POINTS
48
49
        OLOAD≈5
50
51
        $ THE FOLLOWING CARDS REQUEST 4 FRAMES OF TRANSIENT PLOTS
```

75

BEGIN BULK

PAGE

CASE CONTROL DECK ECHO CARD COUNT 52 \$ THESE PLOTS WILL BE PRODUCED IMMEDIATELY ON THE PRINTER 53 \$ 54 OUTPUT(XYOUT) 55 XTITLE=TIME IN SECONDS YTITLE = DEGREES CELSIUS GP(100.1,4) 56 5**7** 58 \$ 'DISP' MEANS THAT THE GRID POINT TEMPERATURE WILL BE PLOTTED VERSUS TIME \$ 'T1' IS REQUIRED (VESTIGIAL REMNANT FROM THE STRUCTURAL VERSION OF NASTRAN) 59 \$ ALL OF THESE PLOTS WILL APPEAR ON ONE FRAME 60 61 62 XYPAPLOT DISP/100(T1),1(T1),4(T1) 63 XTITLE=TIME IN SECONDS 64 YTITLE= DECREES CELSIUS PER SECOND GP(100,1,4) 65 \$ 'VELO' MEANS THAT THE THERMAL VELOCITY WILL BE PLOTTED AS A FUNCTION OF TIME 66 \$ THESE THREE PLOTS WILL APPEAR ON THREE DIFFERENT FRAMES 67 68 69 XYPAPLOT VELO/100(T1)/1(T1)/4(T1)70 71 72 73 74

SLOAD

300

4.

2

8.

```
INPUT BULK DATA DECK ECHO
   1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10
S UNITS MUST BE CONSISTENT
S IN THIS PROBLEM, METERS, WATTS, AND DEGREES CELSIUS ARE USED
S DEFINE GRID POINTS
GRID
                       0.
                               0.
                                       υ.
GRID
        2
                               ٥.
                        . 1
                                       0.
GRID
        3
                        . 2
                               ٥.
                                       ο.
GRID
        4
                        . з
                                       ο.
GRID
        5
                        ٥.
                               . 1
                                       α.
GRID
        6
                        . 1
                               . 1
                                       ο.
        7
GRID
                        . 2
                               . 1
                                       0.
GRID
                        . 3
                               . 1
                                       ٥.
GRID
                        0.
                               . 2
                                       ٥.
GRID
                       0.
        10
                               - . 1
                                       0.
GRID
                               .05
       100
                                       С.
S CONNECT GRID POINTS
$
                       10
CROD
        10
                100
CROD
        20
                100
                       9
CQUAD2 30
                200
                       1
COUAD2 40
                200
                       2
                                       7
                                               6
CQUAD2 50
                        3
                200
$ DEFINE CROSS-SECTIONAL AREAS AND/OR THICKNESSES
PROD
        100
                        ,001
                1000
                        .01
POUAD2 200
                1000
S DEFINE MATERIAL THERMAL CONDUCTIVITY AND THERMAL MASS
MAT4 1000
                200.
                       2.426+6
                                                                      ALUMINUM .
S
S DEFINE CONVECTIVE AREA AND CONVECTIVE COEFFICIENT 'H'
CHBDY 60
                300
                       LINE
                                                                      +CONVEC
+CONVEC 100
                100
YOSHG
       300
                3000
                        314
MAT4
        3000
               200
5 DEFINE CONSTRAINTS
5
MPC
        200
                                       5
                               1.
                                                       -1.
MPC
        200
                10
                               1.
                                                       -1.
S DEFINE APPLIED LOADS
S
```

5

S

```
INPUT BULK DATA DECK ECHO
                 3 ..
                               5 ..
                                      6 .. 7 .. 8 .. 9 .. 10 .
                                  4.
SLOAD 300
             3
                    8.
                           4
SLOAD
      300
              5
                     4.
                            6
                                  8.
SLOAD 300
              7
                     8.
                            В
                                   4.
$ THE FOLLOWING BULK DATA CARDS WERE ADDED TO CONVERT PROBLEM ONE TO
$ PROBLEM TWO. THE ONLY BULK DATA CARD REMOVED FROM THE PREVIOUS SOLUTION WAS
$ THE SPC CARD
$ THIS SPC1 CARD REPLACES THE SPC CARD REMOVED FROM ABOVE
SPC1 100
                     100
$ RADIATION BOUNDARY ELEMENTS
CHBDY
      200
              2000
                     AREA4
                           1
CHBDY
       300
              2000
                     AREA4
                           2
                                   3
       400
                     AREA4
CHEDY
              2000
                                                 7
CHBDY
       500
              2000
                     AREA4
                                                 1
CHBDY
       600
              2000
                     AREA4
                            6
                                   7
                                                 2
                                          3
CHBDY 700
              2000
                     AREA4
                           7
                                                 3
S EMISSIVITY OF RADIATING ELEMENT
PHBDY 2000
                            .90
$ ESTIMATE OF FINAL STEADY STATE SOLUTION VECTOR --- REFERENCED
$ BY TEMP(MATERIAL) IN CASE CONTROL
S
TEMP
       400
              100
                     300.
TEMPD
       400
              300.
S PARAMETERS CONTROLLING RADIATION LOADING AND THE ITERATION LOOPING
PARAM
      TABS
              273.15
PARAM
      SIGMA 5.685E-8
PARAM
       MAXIT
PARAM
       EPSHT
             .0001
$ DEFINITION OF THE RADIATION MATRIX
S ALL OF THE RADIATION GOES TO SPACE
RADLST 200
                                          700
              300
                     400
                            500
                                   600
RADMTX 1
              ٥.
                     ο.
                            Ο.
                                   ο.
                                          0.
                                                 Ο.
RADMTX 2
              Ο.
                     Ο.
                            ٥.
                                   ο.
                                          Ο.
                     Ο.
RADMIX 3
              0.
                            0.
                                   Ο.
RADMIX 4
              Ο.
                     0.
                            ٥.
RADMIX 5
              ٥.
                     ο.
RADMTX 6
              ٥.
```

INPUT BULK DATA DECK ECHO

```
1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 .
5 THE FOLLOWING BULK DATA CARDS WERE ADDED FOR THE TRANSIENT SOLUTION -------
S THEY CONVERT PROBLEM TWO TO PROBLEM THREE
3 NOTE THAT THE SECT SET WAS NOT SELECTED IN CASE CONTROL
3 NOTE THAT SPCF GUTPUT IS NOT REQUESTED IN TRANSIENT
S NOTE THAT THERMAL MASS WAS ADDED TO 'MAT4' CARD 1000
S NOTE THAT THE DIAG CARD IN THE EXECUTIVE CONTROL WAS IRRELEVANT
3 NOTE THAT THE LOAD REQUEST IN CASE CONTROL IS NOW A DLOAD REQUEST
S TRANSIENT SINGLE POINT CONSTRAINT METHOD
$ CONSTRAIN GRID POINT 100 TO 300 DEGREES CELSIUS
CELAS2 300
            1.+5
                   100
SLCAD 300
            100
                    300.+5
S DEFINES A CONSTANT LOAD SET APPLIED FROM T=0. TO T=1.+6 SECONDS
TLGAD2 300
             300
                                  Ο.
                                                ٥.
                                                       ٥.
                                                             +TL1
                                        1.+6
+TL1 0.
             Ο.
S DEFINES THE NUMBER OF INCREMENTS, THE STEP SIZE, AND THE PRINTOUT FREQUENCY
$ REFERENCED IN CASE CONTROL AS 'TSTEP'
$ EACH TIME STEP IS 30 SECONDS
TSTEP 500
                    30. 15
S DEFINES A TEMPERATURE VECTOR --- REFER ICED IN CASE CONTROL AS 'IC'
TEMPD 600 300.
$ THE FOLLOWING CHANGES WERE MADE TO CONVERT PROBLEM THREE TO PROBLEM FOUR
$ THE ONLY BULK DATA CARD WHICH WAS CHANGED WAS THE TSTEP CARD.
S WHOSE FREQUENCY OF OUTPUT WAS CHANGED FROM EVERY STEP TO EVERY 15 STEPS.
$ THE ONLY OTHER CHANGES FROM PROBLEM THREE WERE IN EXECUTIVE CONTROL. WHERE
$ A NEW DIAG CARD AND AN ALTER WERE ADDED.
S
ENDDATA
```

"OTAL COUNT= 144

*** USER INFORMATION MESSAGE 207. BULK DATA NOT SORTED.XSORT WILL RE-ORDER DECK.

			s o	RTED	виц	K DA	T A E	сно			
CARD											
COUNT						. 6	7	8	9	9 10 .	
1 -	CELAS2	300	1.+5	100	1						
2-	CHBDY	60	300	LINE	1	5				+CONVEC	
3-	+CONVEC		100								
4 -	CHBDY	200	2000	AFEA4	1	2	6	5			
5-	CHBDY	300	2000	AREA4	2	3	7	6			
6-	CHBDY	400	2000	AREA4	3	4	8	7			
7 -	CHBDY	500	2000	AREA4	5	۴	2	1			
8-	CHEDY	600	2000	AREA4	6		3	2			
9-	CHBDY	700	200 0	AREA4	7	8	4	3			
10-	COUAD2	30	500	1	2	6	5 6				
11 -	CQUAD2	40	200	2	3	7	6				
12~	CQUAD2	50	200	3	4	8	7				
13-	CROD	10	100	10	2						
14-	CROD	20	100	9	6						
15-	GRID	1		0.0	0.0	0.0					
16-	GRID	2		.1	0.0	C.0					
17-	GRID	3		.2	0.0	0.0					
18-	GRID	4		.3	0.0	0.0					
19-	GRID	5		0.0	.1	0.0					
20-	GRID	6		. 1	.1	0.0					
21 -	GRID	7		.2	. 1	0.0					
22-	GRID	8		. 3	.1	0.0					
23-	GRID	9		0.0	. 2	0.0					
24-	GRID	10		0.0	1	0.0					
25 -	GRID	100	200	05	. 05	0.0				ALUMINUM	
26 - · 27 -	MAT4	1000	200.	2.426+6						ALUMINUM	
00	MAT4	3000	200.	4	1.	_					
28 - 29 -	MPC MPC	200 200	9 10	1	1.	5 1	1	-1. -1.			
30-		EPSHT	.0001	'	١.	'	ı	-1.			
31 -	PARAM Param	MAXIT	8								
32-	PARAM	SIGMA	5.685E-	Ω							
33-	PARAM	TABS	273.15	0							
34-	PHBDY	300	3000	.314							
35-	PHBDY	2000	3000	.314	. 90						
36-	PQUAD2	2000	1000	. 01	. 50						
37-	PROD	100	1000	.001							
38-	RADLST	200	300	400	500	600	700				
39-	RADMIX	1	0.0	0.0	0.0	0.0	0.0	0.0			
40-	RADMTX	2	0.0	0.0	0.0	0.0	0.0	0.0			
41 -	RADMTX	3	0.0	0.0	0.0	0.0	0.0				
42-	RADMTX	4	0.0	0.0	0.0	0.0					
43-	RADMTX	5	0.0	0.0	•						
44-	RADMTX	6	0.0								
45-	SLOAD	300	1	4.	2	8.					
46-	SLOAD	300	3	8.	4	4.					
47 -	SLOAD	300	5	4.	6	8.					
48-	SLOAD	300	7	8.	8	4.					
49-	SLOAD	300	100	300.+5							
50-	SPC1	100	1	100							
51 -	TEMP	400	100	300.							

NON-LINEAR TRANSIENT PROBLEM SORT1 OUTPUT FORM	AT	JANUARY 1.	1376	NASTRAN 12/31/74	PAGE	8
SORT	ED BULK	DATA ECH	0	•		

					S	0	R	Ţ	Ε	D	В	U	L	ĸ		D	Δ	Т	Α		Ε	С	н	0							
CARD																															
COUNT	. 1		2		3				4			5				6				7				8			9		10)	
52-	TEMPD	400		300																											
53-	TEMPD	600		300																											
54 <i>-</i>	TLOAD2	300		300										0	.0 -			1.	. +(5		0.	0		0.	٥.		+	TL1		
5 5-	+TL1	Ο.		0.																											
` 56-	TSTEP	500		45			30			1	15																				
	FNDDATA	1																													

- F. (T.)

22 CHKPNT

23 TA1,

HGPTT.HSLT \$

```
NASTRAN SOURCE PROGRAM COMPILATION
DMAP-DMAP INSTRUCTION
 NO.
  1 BEGIN
             HEAT NO.9 TRANSIENT HEAT TRANSFER ANALYSIS $
  2 FILE
              KGGX=TAPE / KGG=TAPE $
  3 GP1
              GEOM1.GEOM2./HGPL.HEQEXIN.HGPDT.HCSTM.HBGPDT.HSIL/V.N.HLUSET/
              V.N.HALWAYS=-1/V.N.HNOGPDT $
  4 SAVE
              HLUSET, HNOGPDT$
  5 PURGE
              HUSET.HGM.HGO, HKAA, HBAA, HPSO, HKFS, HQP, HEST/HNOGPDT $
  6 CHKPNT
              HGPL.HEQEXIN.HGPDT.HCSTM.HSGPDT,HSIL.HUSET.HGM.HGO.HKAA.HBAA.
              HPSO HKFS HOP HEST $
  7 COND
              HLBL5, HNOGPDT$
 8 GP2
              GEOM2. HEQEXIN/HECT $
  9 CHKPNT
              HECT S
 10 PLTSET
              PCDB HEOEXIN, HECT/HPLTSETX, HPLTPAR, HGPSETS, HELSETS/V, N, HNSIL/V,
              N.JUMPPLOT $
 11 SAVE
              HNSIL.JUMPPLOT $
 12 PRTMSG
              HPLTSETX//$
 13 SETVAL
              //V.N.HPLTFLG/C.N.1/V.N.HPFILE/C.N.O $
 14 SAVE
              HPLTFLG. HPFILE $
 15 COND
              HP1.JUMPPLOT$
 16 PLOT
              HPLTPAR, HGPSETS, HELSETS, CASECC, HBGPDT, HEQEXIN, HSIL, , /HPLOTX1/
              V.N.HNSIL/V.N.HLUSET/V.N.JUMPPLOT/V.N.HPLTFLG/V.N.HPFILE $
 17 SAVE
              JUMPPLOT, HPLTFLG, HPFILE $
 18 PRTMSG
              HPLOTX1//S
 19 LABEL
              HP1 5
 20 CHKPNT
              HPLTPAR, HGPSETS, HELSETS $
 21 GP3
              GEOM3.HEQEXIN.GEOM2/HSLT.HGPTT/C,N.123/C.N.123/C.N.123 $
```

.HECT.EPT.HBGPDT.HSIL.HGPTT.HCSTM/HEST.,HGEI.HECPT.HGPCT/ V.N.

```
NASTRAN SOURCE PROGRAM COMPILATION
DMAP-DMAP INSTRUCTION
NO.
              HLUSET/C, N, 123/V, N, HNOSIMP=-1/C, N, O/C, N, 123/C, N, 123 $
 24 SAVE
              HNOSIMP $
 23 CHKPNT
              HEST, HECPT, HGPCT $
 26 COND
              HLEL1.HNOSIMP$
 27 SMA1
              HCSTM.MPT.HECPT.HGPCT.DIT/HKGGX.HGPST/C.N.123/C.N.123/V.N.
              HNNLK 5
 28 SAVE
              HNNLK S
 29 CHKPNT
              HKGGX, HGPST $
 30 SMA2
              HCSTM, MPT . HECPT, HGPCT, DIT/, HBGG/C, N, 1.0/C, N, 123/V, N,
                                                                      HNOBGG=
             -1/C.N,-1 $
    SAVE
              HNOBGG $
 31
 32 PURGE
              HBNN, HEFF, HEAA, HBGG/HNOBGGS
 33 CHKPNT
              HBGG . HENN . HBFF . HBAA $
 34 LABEL
              HLBL1 $
 35 RMG
              HEST, MATPOOL, HGPTT, HKGGX/HRGG, HQGE, HKGG/C, Y, TABS/C, Y, SIGMA=0.0/
              V.N.HNLR/V.N.HLUSET $
 36 SAVE
              HNLR S
 37 EQUIV
              HKGGK.HKGG/HNLR $
    PURGE
 38
              HRGG, HRNN, HRFF, HRAA, HRDD/HNLR $
 39 CHKPNT
              HRGG.HRNN.HRFF, HRAA.HRDD.HKGG, HQGE $
 40 GP4
              CASECO.GEOM4.HEQEXIN.HSIL.HGPDT/HRG., HUSET./V.N.HLUSET/V.N.
              HMPCF1=-1/V.N.HMPCF2=-1/V.N.HSINGLE=-1/V.N.HOMIT=-1/V,N.HREACT=
              -1/C.N.O/C.N.123/V.N.HNOSET=-1/V.N.HNOL/V.N.HNOA=-1 $
 41 SAVE
              HMPCF', HSINGLE, HOMIT, HNOSET, HREACT, HMPCF2, HNOL, HNOA $
 42 PURGE
              HGM, HGMD/HMPCF1/HGO, HGCD/FCMIT/HKFS, HPSO, HOP/HSINGLE $
 43 EOUIV
              HKGG, HANN/HMPCF1/HRGG, HRNN/HMPCF1/HBGG, HBNN/HMPCF1 $
 44 CHKPNT
              HGM, HRG. HGO, HKFS, HOP, HUSET, HGMD, HGOD, HPSO, HKNN, HRNN, HBNN $
 45 COND
              HLBL2.HNOSIMP $
```

NASTRAN SOURCE PROGRAM COMPILATION DMAP-DMAP INSTRUCTION NO.

- 46 GPSP HGPL.HGPST.HUSET,HSIL/HOGPST \$
- 47 OFP HOGPST....//V.N.HCARDNO \$
- 49 SAVE HCARDNO \$
- 49 LABEL HLBL2 \$
- 50 COND HLBL3.HMPCF1 \$
- 5! MCE1 HUSET, HRG/HGM \$
- 52 CHKPNT HGM \$
- 53 MCE2 HUSET, HGM, HKGG, HRGG, HBGG, /HKNN, HRNN, HBNN, \$
- 54 CHKPNT HKNN, HRNN, HBNN \$
- 55 LABEL HLBL3 \$
- 56 EQUIV HKNN HKFF/HSINGLE/HRNN, HRFF/HSINGLE/HBNN, HBFF/HSINGLE \$
- 57 CHKPNT HKFF.HRFF.HBFF \$
- 58 COND HLBL4.HSINGLE \$
- 59 SCE1 HUSET. HKNN, HRNN, HBNN, /HKFF, HKFS, , HRFF, HBFF, \$
- 60 CHKPNT HKFS, HKFF, HRFF, HBFF \$
- 61 LABEL HLBL4 \$
- 62 EQUIV HKFF.HKAA/HOMIT/HRFF,HRAA/HOMIT/HBFF.HBAA/HOMIT \$
- 63 CHKPNT HKAA.HRAA,HBAA \$
- 64 COND HLBL5, HCMIT \$
- 65 SMP1 HUSE" HKFF.../HGO.HKAA..... \$
- 66 CHKPNT HGO, HI.AA \$
- 67 COND HLBLR. HNLR \$
- 68 SMP2 HUSET HGO , HRFF/HRAA \$
- 69 CHKPNT HRAA S
- 70 LABEL HLBLR \$
- 71 COND HLBL5.HNOBGG \$

NASTRAN SOURCE PROGRAM COMPILATION DMAP-DMAP INSTRUCTION NO.

- 72 SMP2 HUSET.HGO.HBFF/HBAA \$
- 73 CHKPNT HBAA S
- 74 LABEL HLBL5 \$
- 75 DPD DYNAM]CS.HGPL.HSIL.HUSET/HGPLD.HSILD.HUSETD.HTFPOOL.HDLT,..
 HNLFT.HTRL.,HEQDYN/V.N.HLUSET/V.N.HLUSETD/C.N.123 /V.N.HNODLT/
 C.N.123/C.N.123/V.N.HNONLFT/V.N.HNOTRL/C.N.123/C.N.123/ V.N.
 HNOUF \$\frac{1}{2}\$
- 76 -SAVE HIUSETD HNODLT HNOWLET HNOTEL HNOUE 3
- 77 COND HERROE1. HNGTRLS
- 78 EQUIV HGO. HGOD/HNOUE/HGM. HGMD/HNOUE \$
- 75 PURGE HPPO HPSO. HPDO. HPDT/HNODLT \$
- 80 CHKPNT HUSE"D.HEGDYN.HTFPOOL.HDLT,HTRL.HGOD.HGMD,HNLFT,HSILD.HGPLD.
- TY 81 MTRXÎN CASECC.MATPOOL,HEODYN, HTFPOOL/HK2PP, HB2PP/V,N,HLUSETD/ V,N,HNOK2PP/C,N,123/V,N,HNOB2PP \$
 - 82 SAVE HNOK2PP.HNOS2PP \$
 - 83 PARAM //C.N.AND/V.N.HKDEKA/V.N.HNOUE/V.N.HNOK2PP \$
 - 84 PURGE HK2DD/HN0K2PP/HB2DD/HN0B2PP \$
 - 85 EQUIV HKAA, HKDD/HKDEKA/HB2PP, HB2DD/HNOA/HK2PP, HK2DD/HNOA/HRAA, HRDD/HNOUE \$
 - 83 CHKPNT HK2PP, HE2PP, HK2DD, HE2DD, HKDD, HRDD \$
 - 87 COND HLBL6.HNOGPDT \$
 - 83 GKAD HUSEID.HGM.HGO.HKAA.HBAA.HRAA.HK2PP.HB2PF/HKDD.HBDD.HRDD.HGMD.HGDD.HK2DD.HM2DD.HB2DD/C.N.TRANRESP/C.N.DISP/C.N.DIRECT/C.Y.HG=0.0/C.Y.HW3=0.0/C.Y.HW4=0.0/V.N.HN0K2PP/C.N.-1/V.N.HNCB.2PP/V.N.HMPCFI/V.N.HSINGLE/V.N.HOMIT/V.N.HNOUE/C.N.-1/V.N.HNCBGG/V.N.HNOSIMP/C.N.-1
 - HMOBGG/V.N.HMOSTMP
 - 89 LABEL HLBL6 S
 - 90 EQUIV HK2DD.HKDD/HNOSIMP/HB2DD.HBDD/HNOGPDT \$
 - 91 CHKPNT HKDD, HBDD, HRDD, HGMD, HGOD \$
 - 92 TRLG CASECC.HUSETD.HDLT.HSLT.HBGPDT.HSIL.HCSTM.HTRL.DIT.HGMD.HGOD.,

```
NASTRAN SOURCE PROGRAM, COMPILATION
DMAP-DMAP INSTRUCTION
NO.
             HEST/HPPO.HPSO.HPDO.HPDT..HTOL/V.N.HNOSET/V.N.HPDEPDO $
 93 SAVE
             HPDFPDO.HNOSET $
 94 EOUIV
             HPPO.HPDO/HNOSET $
 95 EOUIV
             HPDO. HPDT / HPDEPDO $
 96 CHKPNT
             HPPO.HPDO.HPSO.HTOL.HPDT $
              CASECC. HUSETD, HNLFT, DIT, HGPTT, HKDD, HBDD, HRDD, HPDT, HTRL/HUDVT,
 97 TRHT
             HPNLD/C.Y.BETA=.55/C.Y.TABS=0.0/V.N.HNLR/C.Y.RADLIN=-1 $
 98 CHKPNT
             HUDVT.HPNLD $
              CASECC, HEODYN, HUSETD, HUDVT, HTOL, XYCDB, HPNLD/HOUDV1, HOPNL1/ C,
 99 VDR
              N.TRANRESP/C.N.DIRECT/C.N.O/V.N.HNOD/V.N.HNOP/C.N.O $
100 SAVE
              HNOD HNOP S
101 CHKPNT
             HOUDV7, HOPNL1 $
102 .COND
              HLBL" HNOD $
103 SDR3
              HOUDV1.HOPNL1..../HOUDV2.HOPNL2.... $
104 OFP
              HOUDV2.HOPML2....//V,N,HCARDNO $
105 SAVE
              HCARONO $
106 CHKPNT
              HOPNL2.HOUDV2 $
110 LABEL
              HLBL7 S
              //C.N.AND/V.N.HPJUMP/V,N.HNOP/V,N.JUMPPLOT $
111 PARAM
112 COND
              HLBL9.HPJUMP $
113 EQUIV
              HUDVT HUPV/HNOA $
114 COND
              HLBL8 HNOA S
115 SDR1
              HUSETD., HUDVT., HGOD, HGMD, HPSO, HKFS., /HUPV., HQP/C, N, 1/C, N,
              TRANSNT $
116 LABEL
              HLBLS $
117 CHKPNT
              HUPV, HQP $
118 PLTTRAN HBGPDT.HSIL/HBGPDP.HSIP/V.N.HLUSET/V.N.HLUSEP $
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NASTRAN SOURCE PROGRAM COMPILATION
DMAP-DMAP INSTRUCTION
NO.
119 SAVE
```

HLUSEF \$

120 SDR2 CASECC. HCSTM.MPT.DIT.HEQDYN.HSILD..HTOL.HBGPDP.HPPO.HQP.HUPV. HEST XYCDB/HOPP1, HOGP1, HOUPV1, HOES1, HOEF1 HPUGV /C.N.

TRANRESP &

121 SDR3 HOPP: HOOP1, HOUPV1, HOES1, HOEF1, /HOPP2, HOOP2, HOUF /2, HOES2, HOEF2. \$

122 CHKPNT HOPP2, HOOP2, HOUPV2, HOES2, HOEF2 \$

122 OFP HOPP1, HOQP1, HOUPV1, HOES1, HOEF1, //V, N, HCARDNO \$

122 JUMP HP2

123 CFP HOPP2, HOQP2, HOUPV2, HOEF2, HOES2. //V, N, HCARDNO \$

124 SAVE HCARDNO S

125 COND HP2.JUMPPLOT \$

126 PLOT HPLTPAR, HGPSETS. HELSETS. CASECC. HBGPDT. HEGEXIN, HSIP. . HPUGV/ HPLOTX2/V, h, HNSIL/V, N, HLUSEP/V, N, JUMPPLOT/V, N, HPLTFLG/V, N,

HPFILE \$

127 SAVE HPFILE \$

128 PRTMSG HPLOTX2// 5

129 LABEL HP2 3

130 XYTRAN XYCD3.HOPP2.HOQP2.HOUPV2.HOES2.HOEF2/HXYPLTT/C.N.TRAN/C.N.PSET/

V,N,HPFILE/V,N,HCARDNO \$

131 SAVE HPFILE.HCARDNO \$

132 XYPLOT HXYPLTT// \$

133 LABEL HLBL3 \$

134 JUMP FINIS S

135 LABEL HERRORI \$

136 PRTPARM //C.N.-1/C.N.HDIRTRDS

137 LABEL FINIS5

138 END \$ NASTRAN SOURCE PROGRAM COMPILATION DMAP-DMAP INSTRUCTION NO.

*** USER WARNING MESSAGE 54.
PARAMETER NAMED EPEHT NOT REFERENCED

*** USER WARNING MESSAGE 54.
PARAMETER NAMED MAXIT NOT REFERENCED

NO ERRORS FOUND - EXECUTE NASTRAN PROGRAM

*** USER INFORMATION MESSAGE FULL INTERNAL SPACE NODE AVAILABLE

*** USER INFORMATION MESSAGE & ELEMENTS HAVE A TOTAL VIEW FACTOR (FA/A) LESS THAN 0.99

*** USER INFORMATION MESSAGE 3023. B = 3
C = 0
R = 2

*** USER INFORMATION MESSAGE 3027. SYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

*** USER INFORMATION MESSAGE 3028, B = 5 BEAR = 5 C = 3 CBAR = 1

*** USER INFORMATION MESSAGE 3027, UNSYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS 0 SECONDS.

NON-LINEAR TRANSIENT PROBLEM ... SORT1 OUTPUT FORMAT

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TIME = 0.0

LOAD VECTOR

POINT ID. TYPE ID VALUE ID+1 VALUE ID+2 VALUE ID+3 VALUE ID+4 VALUE ID+5 VALUE 1 \$ 4.000000E 00 8.000000E 00 8.000000E 00 4.000000E 00 4.000000E 00 8.000000E 00 7 S 8.000000E 00 4.000000E-00 100 S 3.000000E 07

TIME = 4.500000E 02

LOAD VECTOR

POINT ID.	TYPE	ID VALUE	ID+1 VALUE	ID+2 VALUE	ID+3 VALUE	ID+4 VALUE	ID+5 VALUE
1	S	4.000000E 00	8.000000E 00	8.000000E 00	4.000000E 00	4.000000E 00	8.000000E 00
7	S	8.000000E 00	4.000000E 00				
100	Ş	3.000000E 07					

NON-LINEAR TRANSIENT PROBLEM ... SORT1 OUTPUT FORMAT JANUARY 1, 1976 NASTRAN 12/31/74 PAGE 18

TIME = 9.00C00CE 02

LOAD VECTOR

POINT ID.	TYPE	ID VALUE	ID+1 VALUE	ID+2 VALUE	ID+3 VALUE	ID+4 VALUE	ID+5 VALUE
1	S	4.000000E 00	8.000000E 00	8.0000COE 00	4.000000E 00	4.000000E 00	8.000000E 00
7	S	8.000000E 00	4.000CGOE 00				•
100	S	3.000000E 07					

TIME = 1.350000E 03

LOAD VECTOR

POINT ID.	TYPE S	ID VALUE 4.000000E 00	ID+1 VALUE 8.000000E 00	ID+2 VALUE 8.000000E 00	ID+3 VALUE 4.000000E 00	ID+4 VALUE 4.000000E 00	ID+5 VALUE 8.000000E 00
7	S	8.000000E 00	4.000000E 00				
100	S	3.000000E 07					

NON-LINEAR TRANSIENT PROBLEM ... SORT1 OUTPUT FORMAT

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20

TIME = 0.0

POINT ID.	TYPE	ID VALUE	ID+1 VALUE	ID+2 VALUE	ID+3 VALUE	ID+4 VALUE	ID+5 VALUE
1	S	3.000000E 02					
7	S	3.000000E 02	3.000000E 02	3.0000G0E 02	3.000000E 02		
100	S	3.000000E 02					

21

TIME = 4.500000E 02

POINT ID.	TYPE	ID VALUE	ID+1 VALUE	ID+2 VALUE	ID+3 VALUE	ID+4 VALUE	ID+5 VALUE
1	S	2.799189E 02	2.5952255 02	2.316098E 02	2.234185E 02	2.799189E 02	2.595225E 02
7	S	2.316100E 02	2.234187E 02	2.799189E 02	2.799189E 02		
100	S	2.999985E 02					

NON-LINEAR TRANSIENT PROBLEM ... SORT! OUTPUT FORMAT JANUARY 1, 1976 NASTRAN 12/31/74 PAGE 22

TIME = 9.000000E 02

POINT ID.	TYPE	ID VALUE	ID+1 VALUE	ID+2 VALUE	ID+3 VALUE	ID+4 VALUE	ID+5 VALUE
1	S	2.7567555 02	2.508229E 02	2.189498E 02	2.092829E 02	2.756755E 02	2.508229E 02
7	S	2.189499E 02	2.092830E 02	2.756755E 02	2.756755E 02		
100	S	2.999983E 02					•

TIME = 1.350000E 03

POINT ID.	TYPE	ID VALUE	ID+1 VALUE	ID+2 VALUE	ID+3 VALUE	ID+4 VALUE	ID+5 VALUE
1	S	2.748357E 02	2.490997E 02	2.164287E 02	2.064647E 02	2.748357E 02	2.490997E 02
7	5	2.164288E 02	2.064649E 02	2.748357E 02	2.748357E 02		
100	S	2.999980E 02					

NON-LINEAR TRANSIENT PROBLEM ... SORT1 OUTPUT FORMAT

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iE 2

XY-OUTPUT SUMMARY

SUBCASE 1
RESPONSE
DISPLACEMENT CURVE 1(3)

CURVE TITLE = X-AXIS TITLE =TIME IN SECONDS Y-AXIS TITLE = DEGREES CELSIUS GP(100.1,4)

THE "FOLLOWING INFORMATION IS FOR THE ABOVE DEFINED CURVE ONLY.

WITHIN THE FRAME X-LIMITS (X = 0.0 TO X = 0.1350000E 04)

THE SMALLEST Y-VALUE = 0.2748357E 03 AT X = 0.1350000E 04

THE LARGEST Y-VALUE = 0.3000000E 03 AT X = 0.0

within the X-Limits of ALL DATA (X = 0.0 TO X = 0.1350000E 04)

THE SMALLEST Y-VALUE = 0.2748357E 03 AT X = 0.1350000E 04

PAGE

XY-DUTPUT SUMMARY

SUBCASE RESPONSE

DISPLACEMENT CURVE 4(3)

CURVE TITLE =

X-AXIS TITLE =TIME IN SECONDS

Y-AXIS TITLE = DEGREES CELSIUS GP(100.1,4)

THE FOLLOWING INFORMATION IS FOR THE ABOVE DEFINED CURVE ONLY.

WITHIN THE FRAME X-LIMITS (X = 0.0 TO X = 0.13500000 04)

THE SMALLEST Y-VALUE = 0.2064647E 03 AT X = 0.1350000E 04

THE LARGEST Y-VALUE = 0.3000000E 03 AT X = 0.0

WITHIN THE X-LIMITS OF ALL DATA (X = 0.0 TO X = 0.1350000E 04)

THE SMALLEST Y-VALUE = 0.2064647E 03 AT X = 0.1350000E 04

THE LARGEST Y-VALUE = 0.30000000E 03 AT X = 0.0

XY-OUTPUT SUMMARY

SUBCASE RESPONSE

DISPLACEMENT CUFVE

100(3)

CURVE TITLE =

X-AXIS TITLE =TIME IN SECONDS

Y-AXIS TITLE = DEGREES CELSIUS CP(100.1,4)

THE FOLLOWING INFORMATION IS FOR THE ABOVE DEFINED CURVE ONLY.

WITHIN THE FRAME λ -LIMITS (X = 0.0 TO X = 0.1350000E 04)

THE SMALLEST Y-VALUE = 0.2999980E 03 AT X = 0.1350000E 04

THE LARGEST Y-VALUE = 0.3000000E 03 AT X = 0.0

WITHIN THE X-LIMITS OF ALL DATA (X = 0.0 TO X = 0.1350000E 04)

THE SMALLEST Y-VALUE - 0.2999980E 03 AT X = 0.1350000E 04

THE LARGEST Y-VALUE . 0.3000000E 03 AT X = 0.0

XY-OUTPUT SUMMARY

SUBCASE RESPONSE

VELOCITY

CURVE

100(3)

CURVE TITLE =

X-AXIS TITLE #TIME IN SECONDS

Y-AXIS TITLE = DEGREES CELSIUS PER SECOND GP(100.1.4)

THE FOLLOWING INFORMATION IS FOR THE ABOVE DEFINED CURVE ONLY.

WITHIN THE FRAME X-LIMITS (X = 0.0 TO X = 0.1350000E 04)

THE SMALLEST Y-VALUE = -0.2441405E-04 AT X = 0.0

THE LARGEST Y-VALUE = 0.0 AT X = 0.1350000E 04

WITHIN THE X-LIMITS OF ALL DATA (X = 0.0 TO X = 0.1350000E 04)

THE SMALLEST Y-VALUE = -0.2441405E-04 AT X = 0.0

THE LARGEST Y-VALUE = 0.0

 $A^{T} X = 0.1350000E 04$

XY-OUTPUT SUMMARY

SUBCASE RESPONSE

VELOCITY

CUF VE

1(3)

XY-PAIRS WITHIN FRAME LIMITS WILL BE PLOTTED PENSIZE = 1

THIS IS CURVE 1 OF WHOLE FRAME 1

CURVE TITLE =

X-AXIS TITLE =TIME IN SECONDS

Y-AXIS TITLE = DEGREES CELSIUS PER SECOND GP(100,1.4)

THE FOLLOWING INFORMATION IS FOR THE ABOVE DEFINED CURVE ONLY.

WITHIN THE FRAME X-LIMITS

(X = 0.0)

TO X = 0.1350000E 04)

THE SMALLEST Y-VALUE = -0.5017089E-01 AT X = 0.0

THE LARGEST Y-VALUE = -0.7161456E-03 AT X = 0.1350000E 04

WITHIN THE X-LIMITS OF ALL DATA (X = 0.0

TO X = 0.1350000E 04)

THE SMALLEST Y-VALUE = -0.5017089E-01 AT X = 0.0

THE LARGEST Y-VALUE = -0.7161456E-03 AT X = 0.1350000E 04

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XY-QU-TPUT SUMMARY

SUBCASE

RESPONSE VELOCITY

CUEVE 4(3)

XY-PAIRS WITHIN FRAME LIMITS WILL BE PLOTTED PENSIZE = 1

THIS IS CURVE 1 OF WHOLE FRAME 2

CURVE TITLE =

X-AXIS TITLE =TIME IN SECONDS

Y-AXIS TITLE = DEGREES CELSIUS PER SECOND GP(100.1.4)

THE FOLLOWING INFORMATION IS FOR THE ABOVE DEFINED CURVE ONLY.

WITHIN THE FRAME X-LIMITS (X = 0.0 TO X = 0.1350000E 04)

THE SMALLEST Y-VALUE = -0.2013183E 00 AT X = 0.0

THE LARGEST Y-VALUE = -0.2401225E-02 AT X = 0.1350000E 04

WITHIN THE X-LIMITS OF ALL DATA (X = 0.0 TO X = 0.1350000E 04)

THE SMALLEST Y-VALUE = -0.2013183E 00 AT X = 0.0

THE LARGEST Y-VALUE = -0.2401225E-02 AT X = 0.1350000E 04

NON-LINEAR TRANSIENT PROBLEM ... SORT1 OUTPUT FORMAT

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F	R	Α	М	E
* * * *	***	****	***	***
* *	* *	* *	* *	* *
* *	* *	* *	* *	* *
* *	* *	* *	* *	* *
and the second				

X-AXIS TITLE = TIME IN SECONDS

+· I I !	DEGREES CELSIUS GA	•	• • • • • • • • • • • • • • • • • • • •		I I
Ī	2.064647E 02		2.532323E 02		3.000000E 02 I
0.0 I 4.5000E 02 I 9.0000E 02 I 1.3500E 03 0		0	I I I I	*	A A A A

3

F R A M E

*** **** *** ***

* * * * * * * * *

* * * * * * * * *

X-AXIS TITLE = TIME IN SECONDS

:	I I DEGREES CELSIUS PER SECOND GP(100.1.4) I I -2.441405E-05		-1.220703E-05		1 1 1 1 0.0
0.0 4.5000E 02 9.0000E 02 1.3500E 03	+	*		*	I I I

NON-LINEAR TRANSIENT PROBLEM ... SORT1 OUTPUT FORMAT

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PAGE

F R A M E

X-AXIS TITLE - TIME IN SECONDS

X-AXIS TITLE = TIME IN SECONDS

				÷-	
I I		GP(100.1.4)	DEGREES CELSIUS PER SEC	" I	, i
-2.401225E-03 I	598E-01	-1.018	-2.013183E-01	I	
* I * I * I	I I I			02 1	0.0 4.5000E 9.000CE 1.3500E

```
NASTRAN LOADED AT LOCATION 12CF20
TIME TO GO . 59 CPU SEC. 259 T/O SEC.
     O CPU-SEC.
                        O ELAPSED-SEC.
                                             SEMI
                                                   BEGN
     O CPU-SEC
                        O ELAPSED-SEC.
                                             SEMT
     1 CPU-SEC.
                        3 FLAPSED-SEC.
                                             NAST
     1 CPU-SEC.
                        3 ELAPSED-SEC.
                                             GNET
     1 CPU-SEC.
                        3 ELAPSED-SEC.
                                             XCSA
     1 CPU-SEC.
                        5 ELAPSED-SEC.
                                             TEP1
     1 CPU-SEC.
                        9 FLARSED-SEC.
                                             XSOR
     2 CPU-SEC.
                       13 ELAPSED-SEC.
                                               DO
                                                   IFP
     3 CPU-SEC.
                        25 ELAPSED-SEC.
                                              END
                                                   TEP
     3 CPU-SEC.
                                             XGPI
                       25 ELAPSED-SEC.
     5 CPU-SEC.
                       32 ELAPSED-SEC
                                             SEM1
                                                   END
                                                   LINKNSO2 ---
     5 CPU-SEC.
                       33 FLAPSED-SEC
    24 I/O SEC.
LAST LINK DID NOT USE
                        40016 BYTES OF OPEN CORE
                                                   LINK END ---
                        35 ELAPSED-SEC.
     5 CPU-SEC.
                                             ----
     5 CPU-SEC.
                        35 ELAPSED-SEC.
                                             XSFA
     5 CPU-SEC.
                        37 FLARSED-SEC.
                                             XSFA
     5 CPU-SEC
                        37 ELAPSED-SEC.
                                             3
                                                   GP1
                                                            BEGN
     5 CPU-SEC.
                        43 ELAPSED-SEC.
                                             3
                                                   GP 1
                                                            EN:D
                                                   GP2
     5 CPU-SEC
                       47 ELAPSED-SEC.
                                             8
                                                            BEGN
     5 CPU-SEC.
                       47 ELAPSED-SEC.
                                                   GP2
                                                            END
     5 CPU-SEC.
                        48 ELAPSED-SEC.
                                             10
                                                   PLISFI
                                                            BEGN
     5 CPU-SEC.
                        49 ELAPSED-SEC.
                                             10
                                                   PLISET
                                                            END
                                                   PRTMSG
                                                            BEGN
     5 CPU-SEC.
                       50 ELAPSED-SEC.
                                             12
                                                   PRIMSG
     5 CPU-SEC.
                       50 ELAPSED-SEC.
                                             12
                                                            END
                                                            BEGN
     5 CPU-SEC.
                       51 ELAFSED-SEC.
                                             13
                                                   SETVAL
     5 CPU-SEC.
                       51 ELAPSED-SEC.
                                                   SETVAL
                                                            END
                                             1.3
                                                   GP3
                                                            BEGN
     5 CPU-SEC.
                       53 ELAPSED-SEC.
                                             21
                                                   GP3
                                                            END
     5 CPU-SEC.
                       64 ELAPSED-SEC.
                                             21
                                                            BEGN
     5 CPU-SEC.
                        64 ELAPSED-SEC.
                                             23
                                                   T \Delta 1
     & CPU-SEC.
                        75 ELAPSED-SEC.
                                             23
                                                   TA1
                                                            END
     6 CPU-SEC.
                        77 FLARSED-SEC.
                                                   LINKN503 ---
    55 I/O SEC.
LAST LINK DID NOT USE
                         82788 BYTES OF OPEN CORE
                                                   LINK END ---
     6 CPU-SEC.
                        81 ELAPSED-SEC.
                                             27
                                                            BEGN
     6 CPU-SEC
                        81 ELAPSED-SEC.
                                                   SMA1
     6 CPU-SEC.
                        85 ELAPSED-SEC.
                                             27
                                                   SMA1
                                                            END
                                                   SMA2
                                                            BEGN
     6 CPU-SEC.
                        86 ELAPSED-SEC.
                                             30
                                                   SMA2
                                                            END
     6 CPU-SEC.
                       US ELAPSED-SEC.
                                             30
                                                   LINKNSO5 ---
     6 CPU-SEC.
                       90 ELAPSED-SEC.
    63 I/O SEC.
LAST LINK DID NOT USE
                        64268 BYTES OF OPEN CORE
     6 CPU-SEC.
                       97 ELAPSED-SEC.
                                                   LINK END ---
                                             35
                                                   RMG
                                                            BEGN
     6 CPU-SEC.
                       97 ELAPSED-SEC.
                                             SDCO
     6 CPU-SEC.
                       101 ELAPSED-SEC.
                                                   MP
     6 CPU-SEC.
                      102 ELAPSED-SEC.
                                             SDCO
                                                   MP
     6 CPU-SEC.
                      103 ELAPSED-SEC.
                                             F5S
     6 CPU-SEC.
                      106 ELAPSED-SEC.
                                             FBS
                                             MPYA
                                                   D
     6 CPU-SEC.
                      107 ELAPSED-SEC.
                                                   METHOD 2 NT.NBR PASSES =
                                                                              1.EST. TIME =
                                                                                                     0.0
                                             MPYA
     7 CPU-SEC.
                       107 ELAPSED-SEC.
                                                   D
                                                   POSE
                                             TRAN
     7 CPU-SEC.
                      108 ELAPSED-SEC.
                      109 ELAPSED-SEC.
                                                   POSE
     7 CPU-SEC.
                                             TRAN
                                             MPYA
                                                   ō
     7 CPU-SEC.
```

109 ELAPSED-SEC.

```
0.0
                                                METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                          MPYA D
    7 CPU-SEC.
                     110 ELAPSED-SEC.
                                                RMG
                                                        END
    7 CPU-SEC.
                     112 ELAPSED-SEC.
                                          35
                                          ---- LINKNS04 ---
                     13 ELAFSED-SEC.
    7 CPU-SEC.
    80 I/O SEC.
LAST LINK DID NOT USE 72520 BYTES OF OPEN CORE
                                          ---- LINK END ---
                     118 ELAPSED-SEC.
     7 CPU-SEC.
                                          40
                                                GP4
                                                        BEGN
                     118 ELAPSED-SEC.
     7 CPU-SEC.
                                                GP4
                                                        END
                                          40
     7 CPU-SEC.
                     121 ELAPSED-SEC.
                                                GPSP
                                                        BEGN
     7 CPU-SEC.
                     23 ELAPSED-SEC.
                                          46
                                                        END
     7 CPU-SEC.
                     123 ELAPSED-SEC.
                                          46
                                                GPSP
                     124 ELAPSED-SEC.
                                          ---- LINKNS14 - -
     7 CPU-SEC.
    88 I/O SEC.
LAST LINK DID NOT USE 117044 BYTES OF OPEN CORE
                     128 ELAPSED-SEC.
                                          ---- LINK END ---
     7 CPU-SEC.
                                          47
                                                OFP
                                                         BEGN
     7 CPU-SEC.
                     128 ELAPSED-SEC.
                                          47
                                                OFP
                                                        END
                     128 ELAPSED-SEC.
     7 CPU-SEC.
                                          ---- LINKNSO4 ---
     7 CPU-SEC.
                     130 ELAPSED-SEC.
    91 I/O SEC.
LAST LINK DID NOT USE 115664 BYTES OF OPEN CORE
                                           ---- LINK END ---
     8 CPU-SEC.
                     133 ELAPSED-SEC.
                                                         BEGN
     8 CPU-SEC.
                     133 ELAPSED-SEC.
                                           51
                                                 MCE1
     8 CPU-SEC.
                     135 ELAPSED-SEC.
                                           51
                                                 MCE1
                                                         END
                                                 MCE2
                                                         BEGN
     8 CPU-SEC.
                     136 ELAPSED-SEC.
                                           53
                                           MPYA D
     8 CPU-SEC.
                     139 ELAPSED-SEC.
                                                 METHOD 2 NT.NER PASSES = 1.EST. TIME =
                                                                                               0.0
                                           MPYA D
     8 CPU-SEC.
                     140 ELAPSED-SEC.
                                           MPYA D
     8 CPU-SEC.
                     140 ELAPSED-SEC.
                                                 METHOD 2 T .NBR PASSES = 1,EST. TIME =
                                                                                               0.0
                                           MPYA D
     8 CPU-SEC.
                      142 ELAPSED-SEC.
     8 CPU-SEC.
                     142 ELAPSED-SEC.
                                           MPYA D
                                                                                                0.0
                                                 METHOD 2 T .NBR PASSES =
                                                                            1.EST. TIME =
                                           MPYA D
      9 CPU-SEC.
                      143 ELAPSED-SEC.
     9 CPU-SEC.
                      145 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 NT.NBR PASSES =
                                                                           1.EST. TIME =
                                                                                                0.0
                      146 ELAPSED-SEC.
                                           MPYA D
     9 CPU-SEC.
     9 CPU-SEC.
                      146 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                                0.0
                                           MPYA D
      9 CPU-SEC.
                      147 ELAPSED-SEC.
     9 CPU-SEC.
                      147 ELAPSED-SEC.
                                           MPYA D
                                                                                                0.0
                                                 METHOD 2 T .NBR PASSES =
                                                                           1.EST. TIME =
     10 CPU-SEC.
                      149 ELAPSED-SEC.
                                           MPYA D
                                           MPYA D
     10 CPU-SEC.
                      151 ELAPSED-SEC.
                                                                                                0.0
                                                 METHOD 2 NT.NER PASSES =
                                                                           1.EST. TIME =
     10 CPU-SEC.
                      152 ELAPSED-SEC.
                                           MPYA D
     10 CPU-SEC.
                      152 ELAPSED-SEC.
                                           MPYA D
                                                                                                0.0
                                                 METHOD 2 T .NBR PASSES =
                                                                           1.EST. TIME =
                                           MPYA D
     10 CPU-SEC.
                      153 ELAPSED-SEC.
                      153 ELAPSED-SEC.
                                           MPYA D
     10 CPU-SEC.
                                                 METHOD 2 T .NBR PASSES =
                                                                            1,EST. TIME =
                                                                                                0.0
     11 CPU-SEC.
                      154 ELAPSED-SEC.
                                           MPYA D
     11 CPU-SEC.
                      155 ELAPSED-SEC.
                                           53
                                                 MCE2
                                                         END
                      157 ELAPSED-SEC.
                                           XSFA
     11 CPU-SEC.
                                           XSFA
     11 CPU-5EC.
                      158 ELAPSED-SEC.
                                           ---- LINKNSO6 ---
     11 CPU-SEC.
                      158 ELAPSED-SEC.
    113 I/O SEC.
 LAST LINK DID NOT USE 102132 BYTES OF OPEN CORE
     11 CPU-SEC.
                      160 ELAPSED-SEC.
                                           ---- LINK END ---
     11 CPU-SEC.
                      160 ELAPSED-SEC.
                                           75
                                                  OPD
                                                          BEGN
                                           75
                                                  DPD
                                                          END
                      164 ELAPSED-SEC.
     11 CPU-SEC.
     11 CPU-SEC.
                      135 ELAPSED-SEC.
                                           XSFA
                      166 ELAPSED-SEC.
                                           XSFA
     11 CPU-SEC.
                      166 ELAPSED-SEC.
                                            ---- LINKN310 ---
     11 CPU-SEC.
    122 I/O SEC.
```

```
LAST LINK DID NOT USE 116416 BYTES OF OPEN CORE
    11 CPU-SEC.
                     168 ELAPSED-SEC.
                                           ---- LINK END ---
    11 CPU-SEC.
                     168 ELAPSED-SEC.
                                           81
                                                 MIRXIN BEGN
    11 CPU-SEC.
                                                 MTRXIN END
                     168 ELAPSED-SEC.
                                           81
                     169 ELAPSED-SEC.
    11 CPU-SEC.
                                           83
                                                 PARAM
                                                         BEGN
    11 CPU-SEC.
                     169 ELAPSED-SEC.
                                                 PARAM
                                                         END
                                           83
    11 CPU-SEC.
                     170 ELAPSED-SEC.
                                           XSFA
    12 CPU-SEC.
                     171 ELAPSED-SEC.
                                           XSFA
    12 CPU-SEC.
                     171 ELAPSED-SEC.
                                           88
                                                 GKAD
                                                         BEGN
    12 CPU-SEC.
                     173 ELAPSED-SEC.
                                           88
                                                 GKAD
                                                         END
    12 CPU-SEC.
                     173 ELAPSED-SEC.
                                           XSFA
    12 CPU-SEC.
                     174 ELAPSED-SEC.
                                           XSFA
    12 CPU-SEC.
                     174 ELAPSED-SEC.
                                                 LINKNSO5 ---
   123 I/O SEC.
LAST LINK DID NOT USE 117064 BYTES OF OPEN CORE
    12 CPU-SEC.
                     176 ELAPSED-SEC.
                                           ---- LINK END ---
    12 CPU-SEC.
                     176 ELAPSED-SEC.
                                           92
                                                 TRLG
                                                         BEGN
    12 CPU-SEC.
                     183 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                                0.0
    12 CPU-SEC.
                                           MPYA D
                     184 ELAPSED-SEC.
    12 CPU-SEC.
                     186 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                0.0
    12 CPU-SEC.
                     187 ELAPSED-SEC.
                                           MPYA D
    13 CPU-SEC.
                     187 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 NT.NBR PASSES =
                                                                            1.EST. TIME =
                                                                                                0.0
    13 CPU-SEC.
                     188 ELAPSED-SEC.
                                           MPYA D
    13 CPU-SEC.
                     .88 ELAPSED-SEC.
                                           MPYA D
                                                                                                0.0
                                                 METHOD 2 NT.NBR PASSES = 1,EST, TIME =
    13 CPU-SEC.
                     .89 ELAPSED-SEC.
                                           MPYA D
    13 CPU-SEC.
                     189 ELAPSED-SEC.
                                           92
                                                TRLG
                                                        END
    13 CPU-SEC.
                     190 ELAPSED-SEC.
                                           ---- LINKNS11 ---
   143 I/O SEC.
LAST LINK DID NOT USE 58172 BYTES OF OPEN CORE
    13 CPU-SEC.
                                           ---- LINK END ---
                     193 ELAPSED-SEC.
    13 CPU-SEC.
                     193 ELAPSED-SEC.
                                           97
                                                 TRHT
                                                         BEGN
    13 CPU-SEC.
                     195 ELAPSED-SEC.
                                           DECO
                                                MP
    13 CPU-SEC.
                     196 ELAFSED-SEC.
                                           DECO
                                                MP
    15 CPU-SEC.
                     241 ELAPSED-SEC.
                                           97
                                                 TRHT
    15 CPU-SEC.
                                                 LINKNS12 ---
                     241 ELAPSED-SEC.
   203 I/O SEC.
LAST LINK DID NOT USE 69268 BYTES OF OPEN CORE
    15 CPU-SEC.
                     245 ELAPSED-SEC.
                                           ----
                                                LINK END ---
    15 CPU-SEC.
                     245 ELAPSED-SEC.
                                           99
                                                 VDR
                                                         BEGN
    15 CPU-SEC.
                     246 ELAPSED-SEC.
                                                 VDR
                                                         END
                                           99
    13 CPU-SEC.
                     247 ELAPSED-SEC.
                                                 PARAM
                                                         BEGN
                                           111
    15 CPU-SEC.
                     247 ELAPSED-SEC.
                                           111
                                                 PARAM
                                                         END
    15 CPU-SEC.
                     247 ELAPSED-SEC.
                                           115
                                                 SDR1
                                                         BEGN
    15 CPU-SEC.
                     248 ELAPSED-SEC.
                                           MPYA
                                                D
                                                 METHOD 2 NT.NBR PASSES # 1.EST. TIME =
                                                                                                0.0
    15 CPU-SEC.
                     249 ELAPSED-SEC.
                                           MPYA D
    16 CPU-SEC.
                     251 ELAPSED-SEC.
                                                 SDR1
                                           115
                                                         FND
    16 CPU-SEC.
                                                 LINKN508 - · -
                     251 ELAPSED-SEC.
   213 I/O SEC.
LAST LINK DID NOT USE 119112 BYTES OF OPEN CORE
    16 CPU-SEC.
                                           ---- LINK END ---
                     257 ELAPSED-SEC.
    16 CPU-SEC.
                     257 ELAPSED-SEC.
                                           118 PLTTRAN BEGN
    16 CPU-SEC.
                     258 ELAPSED-SEC.
                                           118
                                               PLTTRAN END
    16 CPU-SEC.
                     258 ELAPSED-SEC.
                                           ---- LINKNS13 ---
   219 I/O SEC.
LAST LINK DID NOT USE 114512 BYTES OF OPEN CORE
    16 CPU-SEC.
                                                LINK END ---
                     264 ELAPSED-SEC.
                                          ----
                                                SDR2
                                                         BEGN
    16 CPU-SEC.
                     264 ELLESED-SEC.
                                           120
    16 CPU-SEC.
                     267 ELAPSED-SEC.
                                          120
                                                 SDR2
                                                         END
```

LINKNS14 ---

15 CPU-SEC.

267 ELAPSED-SEC.

```
= 228 I/O SEC.
LAST LINK DID NOT USE 66428 SYTES OF OPEN CORE
                   275 ELAPSED-SEC.
    16 CPU-SEC.
                                    ---- LINK END ---
    16 CPU-SEC.
                   275 ELAPSED-SEC.
                                      121 SDR3 BEGN
    16 CPU-SEC.
                   278 ELAPSED-SEC.
                                     121 SDR3
                                                  END
    16 CPU-SEC.
                   278 ELAPSED-SEC.
                                      122 OFP
                                                 BEGN
                                      122 OFP
    17 CPU-SEC.
                   280 ELAPSED-SEC.
                                                  END
    17 CPU-SEC.
                                      130 XYTRAN BEGN
                   Ω€O ELAPSED-SEC.
    19 CPU-SEC.
                   287 ELAPSED-SEC.
                                      130 XYTRAN END
   19 CPU-SEC.
                   288 ELAPSED-SEC.
                                      ---- LINKNSO2 ---
= 246 I/O SEC.
LAST LINK DID NOT USE
                       C BYTES OF OPEN CORE
   19 CPU-SEC.
                   297 ELAPSED-SEC.
                                    ---- LINK END ---
    19 CPU-SEC.
                   297 ELAPSED-SEC.
                                      132 XYPLOT BEGN
   19 CPU-SEC.
                    298 ELAPSED-SEC.
                                    132 XYPLOT END
   19 CPU-SEC.
                    298 ELAPSED-SEC. 138 EXIT
= 247 I/O SEC.
 LAST LINK DID NOT USE 97232 BYTES OF OPEN CORE
 AMOUNT OF OPEN CORE NOT USED = OK BYTES
```

MARIA SA MARIAMANAMAN'AN'AN'AN' AMARAMAMAMAMAMAT DATABATA TAMAMAMAMAMAMA

IMMORPHIA DE LA COMPONICIONA DEL COMPONICIONA DEL COMPONICIONA DEL COMPONICIONA DEL COMPONICIONA BREEK MARKET IN TAKEN BETTER DE LEGEN D **IBM 360-370 SERIES** MODELS 91,95 MINIMARINED A VICTORIA PRIABALI. MANUSARIAN SA REPORTAN MERAPARANJARAN MANUSARIAN MANUSA METERSANDANIAN ARTERIA SENTENTIAN SENTENTA SENTENTA DE LA COMETERSANDA DE LA COMPANSIÓN A COMPAN MALIA DAMMANMENTALIA MMM A PROPERTY OF THE PROPERTY MANAGEMENT AND ANTIQUE OF THE PROPERTY OF THE ////// RIGID FORMAT SERIES M Менентический применя выбрания выправления FAMOUR FARMANTAL IN BRACKETS INDICATOR MAINTAINE MAINTAIN FARMANTAIN MAINTAINE MAINTAI MARKER NEW MINISTER AND A RANGE CONTROL OF THE PROPERTY OF THE LEVEL 15.5.3 MARKATAN DALAMAN MARKATAN MARKATAN DALAMAN MARKATAN DALAMAN MARKATAN MA MAMMAMATA MEMBANASA MEMBANASA MEMBANASA MEMBANASA MEMBANASA MEMBANASA MAMMAMMAMAN MEMBANASA MEMB MEMBANASA MANAGAMAN - 1//////// MANAGAMAN ARABAMAN BIRDAMAN BIRDAMA PROTECTION OF THE PROPERTY OF SAMEON COMPANY MARKMAM MARKET MEMBERSHAMM /MM - -MM MMMMMM MMMMM MMMM MMMM MOMENTAL STATEMENT AND ADMINISTRATION OF THE PARTY OF THE SIMMUNIA MARIADISM MMMMMM/// /// M MM - - MMM MMM MMM MMMM MMMM MM MARKAMARIAN MINISTRA MATERIAL M. ////// MEWM MM--MMMMM MMINIAIMM MMM MM MMM MMMMM MM M MINORAMANAYANAN NMM MMMM///// //// MMM MMMN - - MMMMMM MMDDDDDMM MMM MMM MM MMMM MM 1111 111 MINIMANIMANIM MM MM MMUNICANM MINITARINGAM M - - -MMMMMMMM MMM MM MMMM MM MMMM MM MMMM MANAGORANA / /// ///MM M----MINMMMMMMM MMUMULIM MMILITANIMM MMMMMM м MMMM MM MIMMMMM MINIMINIMINI 11111 // M Mr. vam - - - Mr. amminim MMMM MMDDDMM MMMMMMMMMM MM MMMMM MM////// HAMMAMM MWM: NMCMMMM MMMM - - - - MMMM MEMINIA M MMMMMMM М MM MMMM MMMM ////MMEAN-ANA MMMANGIAM MA MC- LIMM ---M MMG MM MMMMM MM MMMM MMMMMM MM MMMPAMATINE MARIAM MARIAMAN MARIAMAN MARIAMAN - - - MARIAMAN MARIA MMM MMMMMANISHMAN - - MAINTAN ACHMANACHAN - - MAINTAN MANAMAN MMMMMM PERMISE SEMESTED FOR THE PROPERTY OF TH MMMMMODAM MARIA IAW - - MARACIONS AROMANDAMINANDAM SYSTEM GENERATION DATE - 12/31/74

MMMMMMMMMMMMMM

NASTRAN EXECUTIVE CONTROL DECK ECHO

```
$
ID CLASS PROBLEM FIVE, C.E. JACKSON
$ MAXIMUM CPU TIME ALLOWED FOR THE JOB
TIME 10
$ THE THERMAL ANALYZER PORTION OF NASTRAN IS TO BE USED
APP HEAT
$ THE NON-LINEAR TRANSIENT SOLUTION ALGORITHM IS TO BE USED
$
SOL 9
$ REQUEST FOR DIAGNOSTIC WHICH PRINTS OUT CONVERGENCE CRITERIA
$ PRODUCES OUTPUT ONLY FOR SOL 3
DIAG 18
$ REQUEST FOR DIAGNOSTIC PRINTOUT WHICH LISTS THE RIGID FORMAT BEING EXECUTED
$ (IN THIS CASE, SOL 9). THE INCLUSION OF THIS CARD IS OPTIONAL.
DIAG 14
$ THE RIGID FORMAT IS BEING ALTERED TO CAUSE NASTRAN TO STOP PROCESSING
$ AFTER DMAP STATEMENT 20
ALTER 20
EXIT $
$ THE RIGID FORMAT IS BEING ALTERED TO PROVIDE TRANSIENT OUTPUT
$ SORTED BY TIME STEP RATHER THAN BY GRID POINT. COMPARE THE OUTPUT WITH PROBLEM
$ 3 TO SEE THE DIFFERENCE. THIS ALTER PLUS THE DIAG 14 ADDITION ARE THE ONLY
$ CHANGES FROM PROBLEM 3 MADE IN EXECUTIVE CONTROL. THE ONLY OTHER
$ CHANGE WAS MADE TO THE TSTEP CARD IN THE BULK DATA.
ALTER 122
OFP HOPP1.HOOP1.HOUPV1.HOES1.HOEF1.//V.N.HCARDNO $
JUMP HP2
ENDALTER
CEND
```

CASE CONTROL DECK ECHO

```
CARD
COUNT
        $ END OF EXECUTIVE CONTROL --- START CASE CONTROL ***********************
        TITLE NON-LINEAR TRANSIENT PROBLEM ... PRODUCE STRUCTURE PLOT
        $ SPECIFY 51 LINES OF DATA PER PAGE (DOES NOT INCLUDE HEADINGS AT TOP OF PAGE)
10
        LINE=51
11
        $ REQUEST SORTED AND UNSORTED OUTPUT
12
13
        $ IF THIS CARD IS OMITTED, ONLY THE SORTED BULK DATA WILL APPEAR
14
15
        ECHO=BOTH
16
        $ SELECT THE MPC AND LOAD SETS TO BE USED IN THIS SOLUTION
17
18
        $ NOTE THAT NO SPC SET IS SELECTED, AND THAT DLOAD HAS REPLACED LOAD.
19
20
       MPC=200
21
        DLOAD=300
22
23
       S SELECT THE TEMPERATURE SET WHICH IS AN ESTIMATE OF THE FINAL SOLUTION VECTOR
24
       $ THE SELECTION OF THIS SET IS OPTIONAL FOR SOL 9, BUT SHOULD BE MADE IF
       $ THE FINAL TEMPERATURE IS SEVERAL HUNDRED DEGREES DIFFERENT FROM THE
26
       $ IC VECTOR, AND RADIATIVE INTERCHANGES ARE INCLUDED.
27
        TEMP(MATERIAL)=400
28
29
        $ SELECT THE STEP SIZE. NUMBER OF INCREMENTS, AND PRINTOUT FREQUENCY
30
31
32
        TSTEP=500
33
        $
34
        $ SELECT THE TEMPERATURE SET DEFINING THE TEMPERATURE VECTOR AT T=0.
35
36
        IC=600
37
        $ SELECT OUTPUT DESIRED
38
39
40
       OUTPUT
41
        THERMAL=ALL
42
43
       $ DEFINE A GROUP OF GRID POINTS TO BE REFERENCED BY AN OUTPUT REQUEST
44
45
        SET 5 = 1,2,3,4,5,6,7,8,100
46
47
       & REFERENCE A PREVIOUSLY DEFINED GROUP OF GRID POINTS
48
49
       OLOAD=5
50
51
       S THE FOLLOWING CARDS REQUEST 4 FRAMES OF TRANSIENT PLOTS
```

CASE CO-NTROL DECK ECHO

```
CARD
COUNT
      $ THESE PLOTS WILL BE PRODUCED IMMEDIATELY ON THE PRINTER
52
53
      $
54
      OUTPUT(XYOUT)
55
      XTITLE=TIME IN SECONDS
56
      YTITLE= DEGREES CELSIUS GP(100,1,4)
57
      $
      $ 'DISP' MEANS THAT THE GRID POINT TEMPERATURE WILL BE PLOTTED VERSUS TIME
58
59
      $ 'T1' IS REQUIRED (VESTIGIAL REMNANT FROM THE STRUCTURAL VERSION OF NASTRAN)
      $ ALL OF THESE PLOTS WILL APPEAR ON ONE FRAME
60
61
      XYPAPLOT DISP/100(T1),1(T1),4(T1)
62
63
       XTITLE=TIME IN SECONDS
64
      YTITLE= DEGREES CELSIUS PER SECOND GP(100.1.4)
65
66
       $ 'VELO' MEANS THAT THE THERMAL VELOCITY WILL BE PLOTTED AS A FUNCTION OF TIME
67
       $ THESE THREE PLOTS WILL APPEAR ON THREE DIFFERENT FRAMES
68
69
       XYPAPLOT VELO/100(T1)/1(T1)/4(T1)
70
71
       $ THE FOLLOWING SET OF CARDS WILL GENERATE A PLOT OF THE STRUCTURAL
72
       $ ELEMENTS IN THE PROBLEM BEING SOLVED. OUTPUT WILL BE PRODUCED FOR A
73
       $ SC 4020 PLOTTER. THIS PLOT PACKAGE MUST BE THE LAST SET OF CARDS BEFORE 'BEGIN
74
       $ BULK'. A SEVEN TRACK PLOT TAPE MUST BE PROVIDED.
75
76
       OUTPUT(PLOT)
77
       SET 1 ALL
78
       FIND SET 1 ORIGIN 1 SCALE
79
       PLOT SET 1 ORIGIN 1 LABEL GRID POINTS
80
       PLOT SET 1 ORIGIN 1 LABEL ELEMENTS
81
       $*++--
82
       83
       84
85
86
       BEGIN BULK
```

TNPUT BULK DATA DECK

```
6 .. 7 .. 8 .. 9 .. 10 .
$ UNITS MUST BE CONSISTENT
$ IN THIS PROBLEM. METERS. WATTS. AND DEGREES CELSIUS ARE USED
$ DEFINE GRID POINTS
GRID
                        ο.
                                0.
                                        'n.
GRID
                                O.
        2
                        . 1
                                         Ω.
GRID
        3
                        . 2
                                0.
                                         0.
GRID
                                Ο.
                                         ο.
        4
                        . з
GRID
                        Ο.
                                         Ο.
GRID
        6
                        . 1
                                . 1
                                        ٥.
GRID
        7
                        . 2
                                . 1
                                        0.
GRID
        В
                        . 3
                                         0.
                        ٥.
                                 . 2
                                         ο.
GRID
                        ο.
GRID
        10
                                         0.
GRID
        100
                        -.05
                                 . 05
                                         ٥.
$
$ CONNECT GRID POINTS
CROD
                100
                        10
CROD
        20
                100
                        9
                                6
CQUAD2 30
                200
                        1
                                2
                                        6
                                                 5
                200
                        2
COUAD2 40
                                3
                                        7
                                                 6
COUAD2 50
                200
$ DEFINE CROSS-SECTIONAL AREAS AND/OR THICKNESSES
$
PROD
        100
                1000
                        .001
POUAD2 200
                1000
                        .01
$ DEFINE MATERIAL THERMAL CONDUCTIVITY AND THERMAL MASS
$
                                                                          ALUMINUM
MAT4
      1000
                200.
                        2.426+6
$ DEFINE CONVECTIVE AREA AND CONVECTIVE COEFFICIENT 'H'
$
CHBDY 60
                300
                        LINE
                                                                         +CONVEC
+CONVEC 100
                100
                        .314
PHBDY
        300
                3000
                200.
MAT4
        3000
$ DEFINE CONSTRAINTS
$
MPC
                                                         -1.
        200
MPC
                10
                                                         -1.
        200
S DEFINE APPLIED LOADS
                                        8.
SLOAD
        300
```

PAGE

INPUT BULK DATA DECK ECHO

```
з..
                           4 ..
                                   5 .. 6 .. 7 .. 8 .. 9 .. 10 .
  1 .. 2 ..
SLOAD 300
               3
                       8.
                               4
                                       4.
                5
                               6
SLOAD
        300
                       4.
                                       8.
SLOAD
                               8
        300
                7
                                       4.
$ THE FOLLOWING BULK DATA CARDS WERE ADDED TO CONVERT PROBLEM ONE TO
$ PROBLEM TWO. THE ONLY BULK DATA CARD REMOVED FROM THE PREVIOUS SOLUTION WAS
$ THE SPC CARD
$
S
$ THIS SPC1 CARD REPLACES THE SPC CARD REMOVED FROM ABOVE
SPC1
       100
                        100
$ RADIATION BOUNDARY ELEMENTS
CHBDY
        200
                2000
                        AREA4
                                                       5
CHBDY
        300
                2000
                        AREA4
                               2
                                                7
                                                       6
CHBDY
        400
                2000
                        AREA4
                               3
                                                8
                                                       7
· CHBDY
        500
                2000
                        AREA4
                               5
                                        6
                                                2
                                                       1
CHBDY
        600
                2000
                        AREA4
                               6
                                        7
                                                3
                                                       2
CHBDY
        700
                2000
                        AREA4
                               7
$ EMISSIVITY OF RADIATING ELEMENT
S
PHBDY 2000
                                . 90
$ ESTIMATE OF FINAL STEADY STATE SOLUTION VECTOR --- REFERENCED
$ BY TEMP(MATERIAL) IN CASE CONTROL
$
TEMP
        400
                100
                        300.
TEMPD
        400
                300.
$ PARAMETERS CONTROLLING RADIATION LOADING AND THE ITERATION LOOPING
$
PARAM
        TABS
                273.15
        SIGMA
                5.685E-8
PARAM
PARAM
        MAXIT
PARAM
        EPSHT
                .0001
$ DEFINITION OF THE RADIATION MATRIX
$ ALL OF THE RADIATION GOES TO SPACE
RADLST 200
                300
                        400
                                500
                                        600
                                                700
                0.
RADMTX 1
                        Ο.
                                ٥.
                                        0.
                                                0.
                                                        0.
RADMTX 2
                                0.
                0.
                        0.
                                        0.
                                                0.
RADMTX
        3
                Ο.
                        0.
                                Ο.
                                        О.
RADMTX
                0.
                        0.
                                0.
RADMTX 5
                ٥.
                        ٥.
RADMTX 6
                0.
S
```

```
1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 .
S THE FOLLOWING BULK DATA CARDS WERE ADDED FOR THE TRANSIENT SOLUTION ------
$ THEY CONVERT PROBLEM TWO TO PROBLEM THREE
S NOTE THAT THE SPC1 SET WAS NOT SELECTED IN CASE CONTROL
S NOTE THAT SPCE OUTPUT IS NOT REQUESTED IN TRANSIENT
$ NOTE THAT THERMAL MASS WAS ADDED TO 'MAT4' CARD 1000
$ NOTE THAT THE DIAG CARD IN THE EXECUTIVE CONTROL WAS IRRELEVANT
S NOTE THAT THE LOAD REQUEST IN CASE CONTROL IS NOW A DLOAD REQUEST
$ TRANSIENT SINGLE POINT CONSTRAINT METHOD
S CONSTRAIN GRID POINT 100 TO 300 DEGREES CELSIUS
             1 +5
                    100
CELAS2 300
SLOAD 300
             100
                    300.+5
$ DEFINES A CONSTANT LOAD SET APPLIED FROM T=0. TO T=1.+6 SECONDS
TLOAD2 300
             300
                                        1.+6
                                                            +TL1
+TL1 0.
             ٥.
S DEFINES THE NUMBER OF INCREMENTS. THE STEP SIZE, AND THE PRINTOUT FREQUENCY
$ REFERENCED IN CASE CONTROL AS 'ISTEP'
$ EACH TIME STEP IS 30 SECONDS
TSTEP 500
             45
                    30.
$ DEFINES A TEMPERATURE VECTOR --- REFERENCED IN CASE CONTROL AS 'IC'
TEMPD 600
$ THE FOLLOWING CHANGES WERE MADE TO CONVERT PROBLEM THREE TO PROBLEM FOUR
$ THE ONLY BULK DATA CARD WHICH WAS CHANGED WAS THE TSTEP CARD.
$ WHOSE FREQUENCY OF OUTPUT WAS CHANGED FROM EVERY STEP TO EVERY 15 STEPS.
S THE ONLY OTHER CHANGES FROM PROBLEM THREE WERE IN EXECUTIVE CONTROL. WHERE
$ A NEW DIAG CARD AND AN ALTER WERE ADDED.
S THE FOLLOWING CHANGES WERE MADE TO CONVERT PROBELM FOUR TO PROBLEM FIVE
$ A PLOT TAPE WAS REQUESTED
S AN ALTER WAS ADDED IN EXECUTIVE CONTROL
S A PLOT PACKAGE WAS ADDED TO THE CASE CONTROL
$ NO CHANGES WERE MADE TO THE BULK DATA
ENDDATA
```

INPUT BULK DATA DECK ECHO

			s o	RTED	В	ULK	DA	TA	E	СН	0		
CARD				•									
COUNT		. 2	3			5	6		7.		8	 9	10
1 -		300	1.+5	.00	1								
2-		60	300	LINE	1	5							+CONVEC
3-	+CONVEC	100	100										
4 -	CHBDY	200	2000	AREA4	1	2		6		5			
5-	CHBDY	300	2000	AREA4	2	3		7		6			
6-	CHBDY	400	2000	AREA4	3	4		8		7			
7-	CHBDY	500	2000	AREA4	5	6		2		1			
8-	CHBDY	600	2000	AREA4	6	7		3		2			
9-	CHBDY	700	2000	AREA4	7	В		4		3			
10-	CQUAD2	30	200	1	2	ě		4 5 6		-			
11-		40	200	2	3	7		6					
12-		50	200	3	4	8		7					
13-	CROD	10	100	10	2	•		•					
14-	CROD	20	100	9	6								
15-	GRID	1		0.0	0.0	0.0	n						
16-		2.		.1	0.0	0.0							
17-	GRID	3		. 2	0.0	0.0							
18-	GRID	4		.3	0.0	0.0							
19-		5		0.0	.1	0.1							
20-		6		.1	. i								
21-	GRID	7		. 2		0.0							
22-		8		.3	-1	0.9							
23-		9			.1	0.0							
				0.0	. 2	0.0							
24-	GRID	10		0.0	1	0.0							
25-	GRID	100		05	. 05	0.0	D						
26-	MAT4	1000	200.	2.426+6									ALUMINUM
27 -	MAT4	3000	200.										
28 -		200	9	1	1.	5		1		-1.			
29-	MPC	200	10	1	1.	1		1		-1.			
30-	PARAM	EPSHT	.0001										
31-	PARAM	MAXIT	8										
32-	PARAM	SIGMA	5.68 5E-	8									
33-	PARAM	TABS	273.1 5									,	
34-	PHBDY	300	3000	.314									
35 -	PHBDY	2000			. 90								
36-	PQUAD2	200	1000	.01									
37-	PROD	100	1000	.001									
38-	RADLST	200	300	400	500	60	n	700					
39-	RADMTX	1	0.0	0.0	0.0	0.0		0.0		0.0			
40-	RADMIX	2	0.0	0.0	0.0	0.		0.0		•.•			
41-	RADMTX	3	0.0	0.0	0.0	0.		0.0					
42 -	RADMTX	4	0.0	0.0	0.0	•	•						
43 -	RADMTX	5	0.0	0.0	0.0								
44-	RADMTX	6	0.0	0.0						•			
45-	SLOAD	300	1	4.	2	8.							
46-	SLOAD	300	3	8.	4	4.							
47-	SLOAD	300	ა 5	8. 4.	6								
48-	SLOAD	300	7		8	8.							
49-	SLOAD		100	8.	0	•							
		300		300.+5									
50 -	SPC1	100	1	100									
51 -	TEMP	400	100	300.									

NON-LINEAR TRANSIENT PROBLEM ... PRODUCE STRUCTURE PLOT JANUARY 7, 1976 NASTRAN 12/31/74 PAGE

					S	0	R	T	Ε	D		В	U	L	K		D	A	T	A		Æ	C	Н	0							
CARD COUNT	. 1		2		3				4				5				6				7				8			9			10	
52-	TEMPD	400	_	300			•																		_							
53-	TEMPD	600		300																												
54-	TLOAD2	300		300											0.	0			1	. +(6		0	.0)	0.	0		+	TL	1	
55-	+TL1	Ο.		Ο.																												
56-	TSTEP	500		45			3(٥.			15																					
	ENDDATA	١																														

NASTRAN SOURCE PROGRAM COMPILATION DMAP-DMAP INSTRUCTION NO.

NO.		
1	BEGIN	HEAT NO.9 TRANSIENT HEAT TRANSFER ANALYSIS \$
2	FILE	KGGX=1APE/ KGG=TAPE \$
3	GP1	GEOM1.GEOM2./HGPL.HEQEXIN.HGPDT.HCSTM.HBGPDT.HSIL/V.N.HLUSET/V.N.HALWAYS=-1/V.N.HNOGPDT \$
4	SAVE	HLUSET, HNOGPDT\$
5	PURGE	HUSET.HGM.HGO.HKAA.HBAA.HPSO.HKFS.HQP.HEST/HNOGPDT \$
6	CHKPNT	HGPL.HEQEXIN, HGPDT, HCSTM, HBGPDT, HSIL.HUSET, HGM, HGO, HKAA, HBAA, HPSO, HKFS, HQP, HEST \$
7	COND	HLBL5,HNOGPDT\$
8	GP2	GEOM2.HEQEXIN/HECT \$
9	CHKPNT	HECT \$
10	PLTSET	PCDB.FEQEXIN, HECT/HPLTSETX, HPLTPAR, HGPSETS, HELSETS/V.N, HNSIL/V, N, JUMF PLOT \$
11	SAVE	HNSIL, JUMPPLOT \$
12	PRTMSG	HPLTSETX//\$
13	SETVAL	//V.N.HPLTFLG/C.N.1/V.N.HPFILE/C.N.O \$
14	SAVE	HPLTFLG, HPF1LE \$
15	COND	HP1,JUMPPLOT\$
16	PLOT	HPLTPAR, HGPSETS, HELSETS, CASECC, HBGPDT, HEQEXIN, HSIL, ./HPLOTX1/V, N, HNSIL/V, N, HLUSET/V, N, JUMPPLOT/V, N, HPLTFLG/V, N, HPFILE \$
17	SAVE	JUMPPLOT, HPLTFLG. HPFILE \$
18	PRTMSG	HPLOTX1//\$
19	LABEL	HP1 S
20	CHKPNT	HPLTPAR, HGPSETS, HELSETS \$
20	EXIT \$	

GEOM3, HEQEXIN, GEOM2/HSLT, HGPTT/C, N, 123/C, N, 123/C, N, 123 \$

21 GP3

22 CHKPNT

HGPTT.HSLT \$

NASTRAN SOURCE PROGRAM COMPILATION DMAP-DMAP INSTRUCTION NO.

- 23 TA1. .HECT.EPT.HBGPDT.HSIL.HGPTT.HCSTM/HEST..HGET.HECPT.HGPCT/ V.N. HLUSET/C.N.123/V.N.HNOSIMP=-1/C.N.O/C.N.123/C.N.123 \$
- HNOSIMP \$ 24 SAVE
- 25 CHKPNT HEST . HECPT . HGPCT \$
- 25 COND HUBLI . HNOSTMP\$
- 27 SMA1 HCSTM.MPT.HECPT.HGPCT.DIT/HKGGX..HGPST/C.N.123/C.N.123/V.N. HNNLK \$
- 29 SAVE HNNLK \$
- 29 CHKPNT HKGGX.HGPST \$
- SMA2 HCSTM.MPT.HECPT.HGPCT.DIT/.HBGG/C.N.1.0/C.N.123/V.N. HNOBGG= 30 -1/C.N.-1 \$
- SAVE HNOBGG \$ 31
- 32 PURGE HBNN. HBFF. HBAA. HBGG/HNOBGGS
- 33 CHKPNT HBGG. HBNN. HBFF. HBAA \$
- LABEL HLBL1 \$ 34
- 35 RMG HEST, MATPOOL, HGPTT, HKGGX/HRGG, HQGE, HKGG/C, Y, TABS/C, Y, SIGMA=0.0/ V.N.HNLR/V.N.HLUSET \$
- 36 SAVE HNLR \$
- 37 EQUIV HKGGX, HKGG/HNLR \$
- PURGE HRGG. HRNN, HRFF, HRAA, HRDD/HNLR \$ 38
- CHKPNT HRGG.HRNN.HRFF.HRAA.HRDD.HKGG.HQGE \$ 39
- GP4 CASECC.GEOM4.HEGEXIN.HSIL.HGPDT/HRG..HUSET./V.N.HLUSET/V.N. 40 HMPCF1=-1/V,N,HMPCF2=-1/V,N,HSINGLE=-1/V,N,HOMIT=-1/V,N,HREACT= -1/C.N.O/C.N.123/V.N.HNOSET=-1/V.N.HNOL/V.N.HNOA=-1 \$
- SAVE HMPCF1, HSINGLE, HOMIT, HNOSET, HREACT, HMPCF2, HNOL, HNOA \$
- HGM, HCMD/HMPCF1/HGO, HGOD/HOMIT/HKFS, HPSO, HQP/HSINGLE \$ PURGE
- HKGG.FKNN/HMPCF1/HRGG.HRNN/HMPCF1/HBGG.HBNN/HMPCF1 * 43 EQUIV
- CHKPNT HGM.HRG.HGO.HKFS.HQP.HUSET.HGMD.HGOD.HPSO.HKNN.HRNN.HBNN \$
- COND HLBL2, HNOSIMP \$

```
NASTRAN SOURCE PROGRAM COMPILATION
DMAP-DMAP INSTRUCTION
NO.

46 GPSP HGPL,FGPST,HUSET,HSIL/HOGPST $

47 OFP HOGPST,....//V.N.HCARDNO $
```

- 49 SAVE HCARDNO \$
- 49 LABEL HLBL2 \$

- 50 COND HLBL3, HMPCF1 \$
- 51 MCE1 HUSET, HRG/HGM \$
- 52 CHKPNT HGM \$
- 53 MCE2 HUSET.HGM.HKGG.HRGG.HBGG./HKNN.HRNN.HBNN. \$
- 54 CHKPNT HKNN, HRNN, HBNN \$
- 55 LABEL HLBL3 \$
- 56 EQUIV HKNN, FKFF/HSINGLE/HRNN, HRFF/HSINGLE/HBNN, HBFF/HSINGLE \$
- 57 CHKPNT HKFF, HRFF, HBFF \$
- 58 COND HLBL4.HSINGLE \$
- 59 SCE1 HUSET, HKNN, HRNN, HBNN, /HKFF, HKFS, , HRFF, HBFF, \$
- 60 CHKPNT HKFS, HKFF, HRFF, HBFF \$
- 61 LABEL HLBL4 \$
- 62 EQUIV HKFF, HKAA/HOMIT/HRFF, HRAA/HOMIT/HBFF, HBAA/HOMIT \$
- 63 CHKPNT HKAA, HRAA, HBAA \$
- 64 COND HLBL5.HOMIT \$
- 65 SMP1 HUSET.HKFF.,,/HGO,HKAA..... \$
- 66 CHKPNT HGO, HKAA \$
- 67 COND HLBLR, HNLR \$
- 68 SMP2 HUSET, HGO, HRFF/HRAA \$
- 69 CHKPNT HRAA \$
- 70 LABEL HLBLR \$
- 71 COND HLBL5, HNOBGG \$

```
NASTRAN SOURCE PROGRAM COMPILATION
DMAP-DMAP INSTRUCTION
NO.
              HUSET, HGO, HBFF/HBAA $
72 SMP2
 73 CHKPNT
             HBAA $
              HLBL5 $
 74 LABEL
              DYNAMICS, HGPL, HSIL, HUSET/HGPLD, HSILD, HUSETD, HTFPOOL . DLT ...
 75 DPD
              HNLFT .HTRL . HEQDYN/V.N.HLUSET/V.N.HLUSETD/C.N.123 /V.N.HNODLT/
              C.N. 123/C.N. 123/V.N. HNONLFT/V.N. HNOTRL/C.N. 123/C.N. 123/ V.N.
              HNOUE $
              HLUSETD, HNODLT, HNONLFT. HNOTRL, HNOUE $
 76 SAVE
 77 COND
              HERROR1, HNOTRL$
 78 EQUIV
              HGO. HGOD/HNOUE/HGM. HGMD/HNOUE $
    PURGE
              HPPO_FPSO_HPDO_HPDT/HNODLT $
    CHKPNT
              HUSETE . HEODYN . HTFPOOL . HDLT . HTRL . HGOV . HGMD . HNLFT . HSILD . HGPLD .
              HPPO.FPSO, HPDO, HPDT $
              CASECC .MATPOOL .HEODYN .. HTFPOOL/HK2PP .. HB2PP/V .N .HLUSETD/ V .N .
     MTRXIN
              HNOK2FP/C,N.123/V,N,HNOB2PP $
 82
    SAVE
              HNOK2FP.HNOB2PP $
     PARAM
              //C.N.AND/V.N.HKDEKA/V.N.HNOUE/V.N.HNOK2PP $
     PURGE
              HK2DD/HN0K2PP/HB2DD/HN0B2PP $
     EQUIV
              HKAA.HKDD/HKDEKA/HB2PP.HB2DD/HNOA/HK2PP.HK2DD/HNOA/HRAA.HRDD/
              HNOUE $
    CHKPNT
              HK2PP, HB2PP, HK2DD, HB2DD, HKDD, HRDD $
              HLBL6, HNOGPDT $
     COND
88 GKAD
              HUSETD.HGM.HGO.HKAA.HBAA.HRAA..HK2PP..HB2PP/HKDD.HBDD, HRDD.
              HGMD. MGOD. HK2DD. HM2DD. HB2DD/C.N. TRANRESP/C.N. DIRECT/
              C,Y,HG=0.0/C,Y,HW3=0.0/C,Y,HW4=0.0/V,N,HN0K2PP/C,N,-1/ V,N,
              HNOB2FP/V.N.HMPCF1/V.N.HSINGLE/V.N.HOMIT/V.N.HNOUE/ C.N.-1/V.N.
              HNOBGG/V, N, HNOSIMP/C, N, -1 $
89 LABEL
              HLBL6 $
              HK2DD, HKDD/HNOSIMP/HB2DD, HBDD/HNOGPDT $
    EOUIV
    CHKPNT
              HKDD. HBDD, HRDD, HGMD, HGOD $
92 TRLG
              CASECC.HUSETD.HDLT.HSLT.HBGPDT.HSIL.HCSTM.HTRL.DIT.HGMD.HGOD.,
```

```
NASTRAN SOURCE PROGRAM COMPILATION
DMAP-DMAP INSTRUCTION
NO.
              HEST/HPPO.HPSO.HPDO.HPDT.,HTOL/V,N,%NOSET/V,N,HPDEPDO $
93 SAVE
             HPDEPCO. HNOSET $
 94 EQUIV
              HPPO, HPDO/HNOSET $
 95 EQUIV
              HPDO.HPDT/HPDEPDO $
 95 CHKPNT
             HPPO, PPDO, HPSO, HTOL, KPDT $
 97 TRHT
              CASECC, HUSETD, HNLFT, DIT, HGPTT, HKDD, HBDD, HRDD, HPDT, HTRL/HUDVT,
              HPNLD/C, Y, BETA=.55/C, Y, TABS=0.0/V, N, HNLR/C, Y, RADLIN=-1 $
 93 CHKPNT
             HUDVT, HPNLD $
 99 VDR
              CASECC. HEQDYN, HUSETD, HUDVT, HTOL, XYCDB, HPNLD/HOUDV1, HOPNL1/ C.
              N.TRANRESP/C.N.DIRECT/C.N.O/V.N.HNOD/V.N.HNOP/C.N.O $
100 SAVE
              HNOD, FNOP $
101 CHKPNT
              HOUDV1.HOPNL1 $
102 COND
              HLBL7.HNOD $
103 SDR3
              HOUDV1.HOPNL1.,../HOUDV2.HOPNL2.,... $
104 OFP .
              HOUDV2.HOPNL2....//V.N.HCARDNO $
105 SAVE
              HCARDNO $
106 CHKPNT
              HOPNL2, HOUDV2 $
110 LABEL
              HLBL7 $
111 PARAM
              //C,N,AND/V,N,HPJUMP/V,N,HNOP/V,N,JUMPPLOT $
112 COND
              HLBL9, HPJUMP $
113 EQUIV
              HUDVT.HUPV/HNOA $
114 COND
              HLBL8.HNOA $
115 SDR1
              HUSETD., HUDVT., HGOD, HGMD, HPSO, HKFS., /HUPV., HQP/C.N.1/C.N.
              TRANSHT $
     LABEL
              HLBL8 $
117 CHKPNT
              HUPV.HQP $
```

118 PLTTRAN HBGPDT.HSIL/HBGPDP.HSIP/V.N.HLUSET/V.N.HLUSEP \$

PAGE

```
NASTRAN SOURC'E PROGRAM COMPILATION
DMAP-DMAP INSTRUCTION
NO.
```

- 119 SAVE HLUSEF \$
- 120 SDR2 CASECC.HCSTM.MPT.DIT.HEQDYN.HSILD,.HTOL.HBGPDP.HPPO.HQP,HUPV, HEST.XYCDB/HOPP1.HOQP1.HOUPV1.HOES1.HOEF1.HPUGV /C.N. TRANKESP \$
- 121 SDR3 HOPP1.HOQP1.HOUPV1.HOES1.HOEF1./HOPP2.HOQP2.HOUPV2.HOES2. HOEF2. \$
- 122 CHKPNT HOPP2.HOQP2.HOUPV2,HOES2,HOEF2 \$
- 122 OFP HOPP1 .HOOP1 .HOUPV1 .HOES1 .HOEF1 .//V.N.HCARDNO \$
- 122 JUMP HP2
- 123 OFP HOPP2.HOQP2.HOUPV2.HOEF2.HOES2.//V.N.HCARDNO \$
- 124 SAVE HCARDNO \$
- 125 COND HP2, JUMPPLOT \$
- 126 PLOT HPLTPAR. HGPSETS. HELSETS. CASECC. HBGPDT. HEQEXIN. HSIP. . HPUGV/ HPLOT) 2/V.N.HNSIL/V.N.HLUSEP/V.N.JUMPPLOT/V.N.HPLTFLG/V.N. HPFILE \$
- 127 SAVE HPFILE \$
- PRTMSG HPLOTX2// \$
- 129 LABEL HP2 \$
- 130 XYTRAN XYCDB, HOPP2, HOQP2, HOUPV2, HOES2, HOEF2/HXYPLTT/C, N, TRAN/C, N, PSET/ V,N,HPFILE/V,N,HCARDNO \$
- SAVE HPFILE.HCARDNO \$
- 132 XYPLOT HXYPLTT// \$

LABEL

- 134 JUMP FINIS S
- LABEL HERROF:1 \$ 135
- PRTPARM //C.N.-1/C.N.HDIRTRD\$

HLBL9 \$

- 137 LABEL FINIS\$
- 138 END

NASTRAN SOURCE PROGRAM COMPILATION DMAP-DMAP INSTRUCTION NO.

*** USER WARNING MESSAGE 54.
PARAMETER NAMED EPSHT NOT REFERENCED

*** USER WARNING MESSAGE 54.
PARAMETER NAMED MAXIT NOT REFERENCED

NO ERRORS FCUND - EXECUTE NASTRAN PROGRAM

PAGE

MESSAGES FROM THE PLOT MODULE

PLOTTER DATA

THE FOLLOWING PLOTS ARE FOR AN SC 4020 PLOTTER

AN END-OF-FILE MARK FOLLOWS THE LAST PLOT

THE FOLLOWING PLOTS ARE REQUESTED ON PAPER ONLY

ENGINEERING DATA

ORTHOGRAPHIC PROJECTION

ROTATIONS (DEGREES) - GAMMA = 34.27, BETA = 23.17, ALPHA = 0.0 . AXES = +X.+Y.+Z. SYMMETRIC SCALE (OBJECT-TO-PLOT SIZE) = 2.103726E 01

ORIGIN 1 - XO = -1.738504E OO, YO = -4.485910E OO (1NCHES)

MESSAGES FROM THE PLOT MODULE

PLOT 1 UNDEFORMED SHAPE

NON-LINEAR TRANSIENT PROBLEM ... PRODUCE STRUCTURE PLOT

JANUARY 7, 1976 NASTRAN 12/31/74

1

PAGE

MESSAGES FROM THE PLOT MODULE

PLOTTER DATA

THE FOLLOWING FLOTS ARE FOR AN SC 4020 PLOTTER

AN END-OF-FILE MARK FOLLOWS THE LAST PLOT

THE FOLLOWING PLOTS ARE REQUESTED ON PAPER ONLY

ENGINEERING DATA

ORTHOGRAPHIC PROJECTION

ROTATIONS (DEGREES) - GAMMA = 34.27, BETA = 23.17, ALPHA = 0.0 , AXES = +X.+Y.+Z, SYMMETRIC

SCALE (OBJECT-TO-PLOT SIZE) = 2.103726E 01

ORIGIN 1 - XO = -1.738504E 00, YO = -4.485910E 00 (INCHES)

MESSAGES FROM THE PLOT MODULE

PLOT 2 UNDEFORMED SHAPE

THE CASE . The

```
.....
.....
NASTRAN LOADED AT LOCATION OFAE20
TIME TO GO = 59 CPU SEC., 119 I/O SEC.
    O CPU-SEC.
                 O ELAPSED-SEC.
                               SEM1
                                    BEGN
    O CPU-SEC.
                 O ELAPSED-SEC.
                               SEMT
    O CPU-SEC.
                 5 ELAPSED-SEC.
                               NAST
    O CPU-SEC.
                 5 FLAPSED-SEC.
                               GNFI
    O CPU-SEC.
                 5 ELAPSED-SEC.
                               XCS4
    1 CPU-SEC.
                14 ELAPSED-SEC.
                               I FP1
    1 CPU-SEC.
                               XSOR
                19 ELAPSED-SEC.
                                    IFP
    1 CPU-SEC.
                26 ELAPSED-SEC.
                                DO
    2 CPU-SEC.
                37 ELAPSED-SEC.
                                END
                                    IFP
    2 CPU-SEC.
                37 ELAPSED-SEC.
                               XGPI
    4 CPU-SEC.
                43 ELAPSED-SEC.
                               S#8/11
                                    END
    4 CPU-SEC.
                44 ELAPSED-SEC'.
                               ----
                                    LINKNSO2 ---
   25 I/O SEC.
LAST LINK DID NOT USE 40016 BYTES OF OPEN CORE
                                    LINK END ---
    4 CPU-SEC.
                47 ELAPSED-SEC.
                               ----
    4 CPU-SEC.
                47 ELAPSED-SEC.
                               XSFA
    4 CPU-SEC.
                48 ELAPSED-SEC.
                               XSFA
    4 CPU-SEC.
                48 ELAPSED-SEC.
                               3
                                    GP1
                                          BEGN
                                    GP1
    4 CPU-SEC.
                60 ELAPSED-SEC.
                               3
                                          END
    4 CPU-SEC.
                E2 ELAPSED-SEC.
                               8
                                    GP2
                                          BEGN
    4 CPU-SEC.
                €4 ELAPSED-SEC.
                               8
                                    GP2
                                          END
    4 CPU-SEC.
                65 ELAPSED-SEC.
                               10
                                    PLTSET
                                          BEGN
    4 CPU-SEC.
                75 ELAPSED-SEC.
                               10
                                    PLTSET
                                          END
                                    PRTMSG
    4 CPU-SEC.
                75 ELAPSED-SEC.
                               12
                                          BEGN
    4 CPU-SEC.
                76 ELAPSED-SEC.
                               12
                                    PRTMSG
                                         END
    4 CPU-SEC.
                76 ELAPSED-SEC.
                                    SETVAL
                                          BEGN
                               13
                                    SETVAL
    4 CPU-SEC.
                 "6 ELAPSED-SEC.
                               13
                                         END
    4 CPU-SEC.
                77 ELAPSED-SEC.
                               16
                                    PLOT
                                          BEGN
                                    PLOT
    5 CPU-SEC.
                86 ELAPSED-SEC.
                               16
                                          END
    5 CPU-SEC.
                87 ELAPSED-SEC.
                               18
                                    PRTMSG
                                          BEGN
    5 CPU-SEC.
                87 ELAPSED-SEC.
                               18
                                    PRTMSG
                                          END
                                          BEGN
    5 CPU-SEC.
                88 FLAPSED-SEC.
                               20
                                    EXIT
   47 I/O SEC.
```

LAST LINK DID NOT USE 68388 BYTES OF OPEN CORE AMOUNT OF OPEN CORE NOT USED = 39K BYTES

national violation and a second second MEE

MANAGEM MANAGE

MENDA PARAMETERA MANAGEMENTA DE LA CARRA DEL CARRA DEL CARRA DE LA CARRA DEL CARRA DE LA CARRA DEL CARRA DE LA CARRA DEL CARRA DE LA CARRA DEL CARRA DE LA CARRA DEL CARRA DE LA CARRA DE LA CARRA DE LA CARRA DEL REPORTED A DEPOSITION OF A PROPERTY OF A PRO

MINIMIMATATE IN MINISTERN SYNCHATION MARIAMENT CASTACLISM STATES AND SANTAMANIA MARIAMANIA SANTAMANIA MARIAMANIA MINIMIMMMMMIN MM MINISTRACIONA CONTRACTOR DE CO

MOMENTA MARKANIAN MARKANIA TITLE MANAGEMENT OF THE PROPERTY OF THE PROPER

MRRESSINIAN MARKA DA ROBART DA DA DE RESSERVA DE LA RESSERVA DEL RESSERVA DE LA RESSERVA DE LA RESSERVA DEL RESSERVA DE LA RES

MINISTER MANAGEMENT AND THE MICHAEL MANAGEMENT AND THE MANAGEMENT AND NAMES PARAMETERS CONTROL OF THE PROPERTY OF THE PARAMETER MMMMEDINARY CONTROL NAMES AND A TOTAL OF THE PROPERTY OF THE P

MMMM MMMMMMMM MMMMMMM MMMMM MMMMMMMMM /MM --MMMMMM MMMMM MMMM MANAGAMMAMAMA MMMMMM MMMMAMAM MMMMMM/// /// M MM - - MMM MMM MMM MMM MINIMA MIMMIN MM MMRGMMGGMMM MAMMAN MERSONIM M 11111111 MMMMM - - MMMMM MEGALMAGAGAI MIGM MM MMM MARAMA ММ ////mwm mmmm - mmmmmm MMMMMMMMM M MARA 1// //mmmm MMN/MMMM MMM M MMM MM MMMM MM MM MINIMAMMM MM 1111 111 MMMMMMMM - - - M MMMMMMMMM MMM MAIMM M MMM MM MMMM MM MMMMM MIM ММММММММ MMMM MMMMMMMM - - - M MMIGNIMM MASSIMATION MMMM MMMMMM / /// ///MM MMMMMM MM MAMMAM MMMMMMMM MMMMM - - - AMMMM MMMMMMM M MMM MM MMMMM 11111 // M MM/////// MMMMMMM MMMMMMM MIRM MMM - - - - MMMM M MMMM MEDIAMETER MMMM MM MMMM

MARK SAMA

MAMMAM

MM

MM

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MMMM

IBM 360-370 SERIES

RIGID FORMAT SERIES M

LEVEL 15.5.3

MMMM

MM

MODELS 91 95

MMMMMM

SYSTEM GENERATION DATE - 12/31/74

MARANESE CONTRIBUCCIONAL SERVICIAMBANAMINA MARANES - - MARANES MEDICAL MANAGEMENT AND A COMMENTAL PROPERTY OF THE PROPERTY OF

- - - - M

MARKETAN - - SCANMANNA ARTAMAMAMAMAMAM MINISTER MARKET MARKADARAN - - - MARKADARAN MARKADARAN MARKADARAN - - - MARKADARAN

MMMMM

////MMMMMM

MMMM216 M

MM

IMMEMBALANIM - - AMAN'NE SE ESMECHANISMEMBANAMINAMINESESMEMBERS MANAGEMENTAL PROPERTY OF THE P

MM-- MICRESHMINARIAN MINIMARIAN MARKATAN MARKATA

- MANAGLAR MICROMICA SAN MAGRIMANG ANA MAGRIMANG ARANG
MMMMMADAMMAN SAMERAMARAMMMANAMM

MINIMARAMANAMANAMANAMA

```
$ START OF EXECUTIVE CONTROL *******************************
ID CLASS PROBLEM SIX. C.E. JACKSON
$ MAXIMUM CPU TIME ALLOWED FOR THE JOB
$
TIME 10
S THE THERMAL ANALYZER PORTION OF NASTRAN IS TO BE USED
$
APP HEAT
$ THE NON-LINEAR STEADY-STATE SOLUTION ALGORITHM IS TO BE USED
S
SOL 3
S REQUEST FOR DIAGNOSTIC WHICH PRINTS OUT CONVERGENCE CRITERIA
$ PRODUCES OUTPUT ONLY FOR SOL 3
DIAG 18
CEND
```

CASE CONTROL DECK ECHO

```
CARD
COUNT
1
2
      S FND OF FXECUTIVE CONTROL --- START CASE CONTROL *****************************
વ
      Cxx,
      TITLE NON-LINEAR STEADY-STATE PROBLEM ... K = F(T)
      S SPECIFY 51 LINES OF DATA PER PAGE (DOES NOT INCLUDE HEADINGS AT TOP OF PAGE).
10
      LINE=51
11
12
      $ REQUEST SORTED AND UNSORTED OUTPUT
13
      $ 1F THIS CARD IS OMITTED. ONLY THE SORTED BULK DATA WILL APPEAR
14
15
      ECHO=BOTH
16
      $ SELECT THE SPC. MPC. AND LOAD SETS TO BE USED IN THIS SOLUTION
17
18
19
      SPC=100
      MPC=200
20
21
      LOAD=300
22
      S SELECT THE TEMPERATURE SET WHICH IS AN ESTIMATE OF THE FINAL SOLUTION VECTOR
23
24
25
     TEMP(MATERIAL)≈400
26
27
      $ SELECT THE OUTPUT DESIRED (TEMPERATURES, LOADS, AND CONSTRAINT POWERS)
28
29
      QUITPUT
30
      THERMAL=ALL
31
      OLOAD=ALL
32
      SPCE=ALL
33
      $xx********************************
34
      35
36
37
      $
38
      BEGIN BULK
```

INPUT BULK DATA DECK ECHO

```
4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 .
S UNITS MUST BE CONSISTENT
3 IN THIS PROBLEM. METERS, WATTS, AND DEGREES CELSIUS ARE USED
S DEFINE GRID POINTS
GRID
                                        ٥.
GRID
        2
                        . 1
                                ٥.
                                        0.
GRID
        3
                        . 2
                                        0.
GRID
                        . З
                                Ο,
                                        ο.
        5
GRID
                        ο.
                                        Ο,
GRID
                        . 1
                                . 1
                                        С.
GRID
                        . 2
                                        Ο.
                                . 1
                        . з
GRID
        8
                                        0.
                                . 1
GRID
        9
                        Ο.
                                . 2
                                        С.
GR1D
        10
                        Ο.
                                - . 1
                                        ο.
GRID
        100
                        - . 05
                                .05
                                        Ο.
S CONNECT GRID POINTS
5
CROD
        10
                10C
                        10
                                2
CROD
        20
                100
                        9
                                6
                200
                                                5
CQUAD2 30
                        1
                                2
                                        6
CQUAD2 40
                200
                        2
                                3
                                        7
                                                6
CQUAD2 50
                200
                        3
                                                 7
S DEFINE CROSS-SECTIONAL AREAS AND/OR THICKNESSES
S
PROD
                1000
                         .001
      100
FQUAD2 200
                1000
                        .01
S DEFINE MATERIAL THERMAL CONDUCTIVITY
S
MAT4
     1000
                200.
                                                                         ALUMINUM
$
S DEFINE CONVECTIVE AREA AND CONVECTIVE COEFFICIENT 'H'
S
                                                                         +CONVEC
CHBDY 60
                300
                         LINE
                               1
                                         5
+CONVEC 100
                100
PHBDY
        300
                3000
                         .314
MAT4
        3000
                200.
S
S DEFINE CONSTRAINTS
3
MPC
                9
                                         5
        200
                                1.
                                                         -1.
MPC
        200
                10
                                                         -1.
S DEFINE APPLIED LOADS
$
                                         8.
SLOAD
        300
                1
```

RADLST 200

RADMTX 1

RADMIX 2

RADMIX 3

RADMIX 4

RADMIX 5

RADMTX 6

\$

300

Ο.

٥.

٥.

٥.

٥.

ο.

400

٥.

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0. -

Ο.

٥.

500

0.

0.

0.

Ο.

600

٥.

Ο.

0.

```
TNPUT BULK DATA DECK FCHO
                                  5 ..
                                          6 .. 7 .. 8 .. 9 .. 10 .
                      8.
SLOAD 300
               3
                              4
                                      4.
SLOAD
       300
               5
                       4.
                              6
                                      8.
SLOAD
       300
               7
                       R.
                              В
                                      4.
$ THE FOLLOWING BULK DATA CARDS WERE ADDED TO CONVERT PROBLEM ONE TO
$ PROBLEM TWO. THE ONLY BULK DATA CARD REMOVED FROM THE PREVIOUS SOLUTION WAS
$ THE SPC CARD
$ THIS SPC1 CARD REPLACES THE SPC CARD REMOVED FROM ABOVE
SPC1
     100
                       100
$
$ RADIATION BOUNDARY ELEMENTS
CHBDY
       200
               2000
                       ΔΡΕΔ4
CHBDY
       300
               2000
                       ARFA4
                                                      6
                       ΔΡΕΔ4
                              3
CHBDY
       400
               2000
                                              8
                                                      7
                       AREA4
                              5
CHBDY
       500
               2000
                                      6
                                                      1
CHBDY
       600
               2000
                       AREA4
                              6
                                      7
                                                      2
                                              3
CHBDY
       700
               2000
                       AREA4
                              7
S EMISSIVITY OF RADIATING ELEMENT
PHBDY 2000
$ ESTIMATE OF FINAL STEADY .STATE SOLUTION VECTOR --- REFERENCED
S BY TEMP(MATERIAL) IN CASE CONTROL
TEMP
                       300.
        400
               100
TEMPD
       400
               300.
$ PARAMETERS CONTROLLING RADIATION LOADING AND THE ITERATION LOOPING
PARAM
       TABS
               273.15
PARAM
       SIGMA 5.685E-8
PARAM
       MAXIT
               8
PARAM EPSHT
              .0001
S DEFINITION OF THE RADIATION MATRIX
$ ALL OF THE RADIATION GOES TO SPACE
```

700

٥.

О.

Ο.

INPUT BULK DATA DECK ECHO

								8 *********	9 10 .
	\$ THE FO	DLLOWING	BULK DAT	A CARDS	WERE AD	DED TO CO	NVERT PRO	BLEM TWO	
	S OF TEM	MPERATUR	E.						
						OC TEMPER		ENDENT. WATTS/MT-C	
								WATTS/MT-C	
	MATT4 TABLEM1		2000						+TM1
	+ TM 1 \$	200.	1.	300.		ENDT			
			ATA ***	*****	******	******	* * * * * * * * *	******	************ ***********
	\$ ENDDATA								
TOTAL	COUNT=	120							

*** USER INFORMATION MESSAGE 207, BULK DATA NOT SORTED, XSORT WILL RE-ORDER DECK.

			5.0	RTE	D B U	LK D	АТА	ЕСНО		
CARD								// -		
COUNT	1	2	3	4	5	6	7	8	9	10 .
1 -	CHBDY	60	300	LINE	1	5				+CONVEC
2-	+CONVEC	100	100							
3-	CHBDY	200	2000	AREA4	1	2	6	5		
4 -	CHBDY	300	2000	AREA4	2	3	7	6		
5-	CHBDY	400	2000	AFEA4	3	4	8	7		
6-	CHBDY	500	2000	AREA4	5	6	2	1		
7 -	CHBDY	600	2000	AREA4	6	7	3	2		
8-	CHBDY	700	2000	AREA4	7	8	4	3		
9-	CQUAD2	30	200	1	2	6	5			
10-	CQUAD2	40	200	2	3	7	6			
11-	CQUAD2	50	200	3	4	8	7			
12-	CROD	10	100	10	2					
13-	CROD	20	100	9	6					
14-	GRID	1		0.0	0.0	0.0				
15 <i>-</i>	GRID .	2		. 1	0.0	0.0				
16-	GRID	3		. 2	0.0	0.0				
17-	GRID	4		. 3	0.0	0.0				
18-	GRID	5		0.0	. 1	0.0-				
19-	GRID	6		. 1	. 1	0.0				
20-	GRID	7		. 2	. 1	0.0				
21-	GRID	8		. 3	. 1	0.0				i
22-	GRID	9		0.0	. 2	0.0				
23-	GRID	10		0.0	1	0.0				
24-	GRID	100		05	. 05	0.0				
25-	MAT4	1000	200.							ALUMINUM
26-	MAT4	3000	200.							
27-	MATT4	1000	2000							
28-	MPC	200	9	1	1.	5	1	-1.		
29-	MPC	200	10	1	1.		1	-1,		
30-	PARAM	EPSHT	.0001							
31 -	PARAM	MAXIT	8							
32-	PARAM	SIGMA	5.685E-	8						
33-	PARAM	TABS	273.1 5							•
34-	PHBDY	300	3000	.314						
35-	PHBDY	2000			. 90					
36-	PQUAD2	200	1000	. 01						
37 -	PROD	100	1000	.001						
38-	RADLST	200	300	400	500	€CO	700			
39-	RADMIX	1	0.0	0.0	0.0	0.0	0.0	0.0		
40-	RADMTX	2	0.0	0.0	0.0	0.0	0.0			
41 -	RADMIX	3	0.0	0.0	0.0	0.0				
42-	RADMTX	4	0.0	0.0	0.0					
43-	RADMTX	5	0.0	0.0						
44-	RADMTX	6	0.0	_	_					
45-	SLOAD	300	1	4.	2	8.				
46-	SLOAD	300	3	8.	4	4.				
47 -	SLOAD	300	5	4.	6	8.				
48-	SLOAD	300	7	8.	8	4.				
49-	SPC1	100	1	100						
50-	TABLEM1									+TM1
51 -	+TM1	200.	1.	300.	1.25	ENDT				

SORTED BULK DATA ECHO

CARD
COUNT . 1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 .
52- TEMP 400 100 300.

53- TEMPD 400 300.

ENDDATA

NO ERRORS FOUND - EXECUTE NASTRAN PROGRAM

*** USER INFORMATION MESSAGE FULL INTERNAL SPACE NODE AVAILABLE

*** USER INFORMATION MESSAGE . 6 ELEMENTS HAVE A TOTAL VIEW FACTOR (FA/A) LESS THAN 0.99

*** USER INFORMATION MESSAGE 3023, B = 3
C = 0

1,1

R = 2

*** USER INFORMATION MESSAGE 3027, SYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

*** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKFF HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 1

*** SYSTEM WARNING N'ESSAGE 2169. THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKSF HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET * 2

*** SYSTEM WARNING MESSAGE 2169. THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKFS
HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2

*** SYSTEM WARNING MESSAGE 2169. THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKSS
HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 1

*** SYSTEM WARNING MESSAGE 2169. THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HRFN
HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2

*** SYSTEM WARNING MESSAGE 2169. THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HRSN HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2

*** USER INFORMATION MESSAGE 3028, B = 4 BBAR = 7

*** USER INFORMATION MESSAGE 3027, UNSYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

DIAG 18 OUTPUT FROM SSGHT

ITERATION	EPSILON-P	LAMBDA-1	EPSILON-T
*========		z * = * = * = * = * = * = * = * = * = *	=======================================
1	7.890701E-02		
2	5.685221E-03	1.539461E 01	5.038404E-04
3	9.086095E-04	6.397292E 00	2.097907E-04
Δ	1 521550E-04	6 D26622F DD	3 7369175-05

*** USER INFORMATION MESSAGE 3086, ENTERING SSGHT EXIT MODE BY REASON NUMBER 1 (NORMAL CONVERGENCE)

NON-LINEAR STEADY-STATE PROBLEM ... K = F(T) JANUARY 1, 1976 NASTRAN 12/31/74 PAGE

TEMPERATURE VECTOR

POINT ID.	TYPE	ID VALUE	ID+1 VALUE	ID+2 VALUE	ID+3 VALUE	ID+4 VALUE	ID+5 VALUE
1	S	2.735178E 02	2.516375E 02	2.232828E 02	2.144910E 02	2.735178E 02	2.516375E 02
7	S	2.232828E 02	2.144910E 02	2.735178E 02	2.735178E 02		
100	S	3.000000E 02					

NON-LINEAR STEADY-STATE PROBLEM ... K = F(T) JANUARY 1, 1976 NASTRAN 12/31/74

LOAD VECTOR

PAGE

POINT ID. TYPE ID VALUE ID+1 VALUE ID+2 VALUE ID+3 VALUE ID+4 VALUE ID+5 VALUE
1 S 4.000000E 00 8.000000E 00 4.000000E 00 4.000000E 00 8.000000E 00
7 S 8.000000E 00 4.000000E 00

FORCES OF SINGLE-POINT CONSTRAINT

POINT ID. TYPE ID VALUE ID+1 VALUE ID+2 VALUE ID+3 VALUE ID+4 VALUE ID+5 VALUE 100 S 1.663081E 02

```
NASTRAN LOADED AT LOCATION 120720
TIME TO GO = 59 CPU St.C., 239 I/O SEC.
     O CPU-SEC.
                       O ELAPSED-SEC.
                                          SEM1
                                                BEGN
     O CPU-SEC.
                                          SEMT
                       O ELAPSED-SEC.
     O CPU-SEC.
                       3 ELAPSED-SEC.
                                          NAST
     O CPU-SEC.
                       3 ELAPSED-SEC.
                                          GNFI
                                          XCSA
     O CPU-SEC.
                       3 ELAPSED-SEC.
     1 CPU-SEC.
                       6 ELAPSED-SEC.
                                          IFP1
     1 CPU-SEC.
                       9 ELAFSED-SEC.
                                          XSOR
     1 CPU-SEC.
                      15 ELAPSED-SEC.
                                           DO IFP
     2 CPU-SEC.
                      34 ELAPSED-SEC.
                                           END
                                               ΙFΡ
     2 CPU-SEC.
                      34 ELAPSED-SEC.
                                          XGPI
     3 CPU-SEC.
                      40 ELAPSED-SEC.
                                          SEM1
                                               END
     3 CPU-SEC.
                      41 ELAPSED-SEC.
                                               LINKNSO2 ---
    22 I/O SEC.
LAST LINK DID NOT USE
                            O BYTES OF OPEN CORE
                      43 ELAPSED-SEC.
     3 CPU-SEC.
                                          ---- LINK END ---
     3 CPU-SEC.
                      44 ELAPSED-SEC.
                                          XSFA
                                          XSFA
     3 CPU-SEC.
                      45 ELAPSED-SEC.
     3 CPU-SEC.
                      45 ELAPSED-SEC.
                                          2
                                                GP1
                                                        BEGN
     3 CPU-SEC.
                      53 ELAPSED-SEC.
                                          2
                                                GP1
                                                        END
     3 CPU-SEC.
                      53 ELAPSED-SEC.
                                          5
                                                GP2
                                                        BEGN
     3 CPU-SEC.
                      54 ELAPSED-SEC.
                                          5
                                                GP2
                                                        END
                      55 ELAPSED-SEC.
                                          7
                                                PLTSET
                                                        BEGN
     3 CPU-SEC.
     3 CPU-SEC.
                      56 ELAPSED-SEC.
                                          7
                                                PLTSET
                                                        END
     3 CPU-SEC.
                                                PRIMSG
                                                        EEGN
                      58 ELAPSED-SEC.
                                          9
                                                PRTMSG
     3 CPU-SEC,
                      58 ELAPSED-SEC.
                                          9
                                                        END
     3 CPU-SEC.
                      59 ELAPSED-SEC.
                                          10
                                                SETVAL
                                                        BEGN
     3 CPU-SEC.
                      59 ELAPSED-SEC.
                                                SETVAL
                                                        END
     3 CPU-SEC.
                      61 ELAPSED-SEC.
                                                GP3
                                                        BEGN
                                          18
                                                GP3
                                                        END
     4 CPU-SEC.
                      72 ELAPSED-SEC.
                                          18
                                                        BEGN
     4 CPU-SEC.
                      73 ELAPSED-SEC.
                                          20
                                                TA1
     4 CPU-SEC.
                      88 ELAPSED-SEC.
                                          20
                                                TA1
                                                        END
     4 CPU-SEC.
                      89 ELAPSED-SEC.
                                                LINKNSO3 ---
    52 I/O SEC.
LAST LINK DID NOT USE
                      41828 BYTES OF OPEN CORE
                      94 ELAPSED-SEC.
                                          ---- LINK END ---
     4 CPU-SEC.
                                                SMA1
                                                        BEGN
     4 CPU-SEC.
                      94 ELAPSED-SEC.
                                          24
     4 CPU-SEC.
                      97 ELAPSED-SEC.
                                                SMA1
                                                        END
     4 CPU-SEC.
                      98 ELAPSED-SEC.
                                               LINKNSO5 ---
    57 I/O SEC.
LAST LINK DID NOT USE 23338 BYTES OF OPEN CORE
     4 CPU-SEC.
                     100 ELAPSED-SEC.
                                          ---- LINK END ---
     4 CPU-SEC.
                     100 ELAPSED-SEC.
                                          27
                                                RMG
                                                        BEGN
     4 CPU-SEC.
                     103 ELAPSED-SEC.
                                          SDCO
                                                MP
     4 CPU-SEC.
                     104 ELAPSED-SEC.
                                          SDCO
                                               MP
                                          FBS
     4 CPU-SEC.
                     105 ELAPSED-SEC.
     4 CPU-SEC.
                     106 ELAPSED-SEC.
                                          FBS
                                               D
     4 CPU-SEC.
                     107 ELAPSED-SEC.
                                          MPYA
                                                METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                             0.0
     5 CPU-SEC.
                     108 ELAPSED-SEC.
                                          MEYA D
                                          TRAN POSE
     5 CPU-SEC.
                     108 ELAPSED-SEC.
                                          TRAN POSE
     5 CPU-SEC.
                     109 ELAPSED-SEC.
                                               D
     5 CPU-SEC.
                                          MPYA
                     109 ELAPSFD-SEC.
                                                METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                             0.0
                                               Ð
     5 CPU-SEC.
                     1:0 ELAPSED-SEC.
                                          MPYA
```

```
5 CPU-SEC.
                     113 ELAPSED-SEC.
                                          27
                                                RMG
                                                        END
                                          ---- LINKNSO4 ---
     5 CPU-SEC.
                     115 ELAPSED-SEC.
   73 I/O SEC.
LAST LINK DID NOT USE 31560 BYTES OF OPEN CORE
                                         ---- LINK END ---
     5 CPU-SEC.
                     119 ELAPSED-SEC.
     5 CPU-SEC.
                     119 ELAPSED-SEC.
                                          32
                                                GP4
                                                        BEGN
     5 CPU-SEC.
                     125 ELAPSED-SEC.
                                          32
                                                CP4
                                                        END
     5 CPU-SEC.
                     127 ELAPSED-SEC.
                                          38
                                                GPSP
                                                        BEGN
                                                GPSP
                                                        END
     5 CPU-SEC.
                     127 ELAPSED-SEC.
                                          38
     5 CPU-SEC.
                     128 ELAPSED-SEC.
                                          ---- LINKNS14 ---
    84 I/O SEC.
LAST LINK DID NOT USE 76084 BYTES OF OPEN CORE
     5 CPU-SEC.
                     132 ELAPSED-SEC.
                                          ---- LINK END - --
     5 CPU-SEC.
                     132 ELAPSED-SEC.
                                          39 OFP
                                                        BEGN
     5 CPU-SEC.
                     102 ELAPSED-SEC.
                                          39
                                                OFP
                                                        END
     5 CPU-SEC.
                     103 ELAPSED-SEC.
                                          ---- LINKNSO4 ---
    88 I/O SEC.
LAST LINK DID NOT USE 74704 BYTES OF OPEN CORE
                     136 ELAPSED-SEC.
     5 CPU-SEC.
                                          ---- LINK END ---
     5 CPU-SEC.
                     136 ELAPSED-SEC.
                                          42
                                                MCE1
                                                        BEGN
                                                MCE1
     5 CPU-SEC.
                     139 ELAPSED-SEC.
                                          42
                                                        END
                                                        BEGN
     6 CPU-SEC.
                     139 ELAPSED-SEC.
                                          44
                                                MCE2
     6 CPU-SEC.
                     141 ELAPSED-SEC.
                                          MPYA D
                                                METHOD 2 NT.NBR PASSES ≈ 1.EST. TIME -=
                                                                                               0.0
     6 CPU-SEC.
                                          MPYA D
                     142 ELAPSED-SEC.
     6 CPU-SEC.
                     142 ELAPSED-SEC.
                                          MPYA D
                                                METHOD 2 T ,NBR PASSES ≈ 1.EST. TIME ≈
                                                                                               0.0
     6 CPU-SEC.
                     143 ELAPSED-SEC.
                                          MPYA D
     6 CPU-SEC.
                     143 ELAPSED-SEC.
                                          MPYA D
                                                METHOD 2 T .NBR PASSES ≈
                                                                          1.EST. TIME =
                                                                                               0.0
     6 CPU-SEC.
                     144 FLAPSED-SEC.
                                          MPYA D
     6 CPU-SEC.
                     146 ELAPSED-SEC.
                                          MPYA D
                                                                                               0.0
                                                METHOD 2 NT, NBR PASSES = 1.EST. TIME =
     7 CPU-SEC.
                     147 ELAPSED-SEC.
                                          MPYA D
     7 CPU-SEC.
                     147 ELAPSED-SEC.
                                          MPYA D
                                                METHOD 2 T ,NBR PASSES =
                                                                          1,EST. TIME =
                                                                                               0.0
     7 CPU-SEC.
                     148 ELAPSED-SEC.
                                          MPYA D
     7 CPU-SEC.
                     148 ELAPSED-SEC.
                                          MPYA D
                                                METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                               0.0
                     149 ELAPSED-SEC.
                                          MPYA D
     7 CPU-SEC.
     7 CPU-SEC.
                     149 ELAPSED-SEC.
                                           44 MCE2
                                                        END
                                           ---- LINKNS07 ---
     7 CPU-SEC.
                     150 ELAPSED-SEC.
   107 I/O SEC.
LAST LINK DID NOT USE 68372 BYTES OF OPEN CORE
     7 CPU-SEC.
                     155 ELAPSED-SEC.
                                          ---- LINK END ---
     7 CPU-SEC.
                     155 ELAPSED-SEC.
                                           50
                                                VEC
                                                         BEGN
     7 CPU-SEC.
                     156 ELAPSED-SEC.
                                                VEC
                                                         END
                                           50
     7 CPU-SEC.
                                                        BEGN
                     156 ELAPSED-SEC.
                                           51
                                                PARTN
                                                        END
     8 CPU-SEC.
                      158 ELAPSED-SEC.
                                           51
                                                 PARTN
     8 CPU-SEC.
                     158 ELAPSED-SEC.
                                           XSFA
     8 CPU-SEC.
                     159 ELAPSED-SEC.
                                           XSFA
                                                PARTN
                                                         BEGN
     8 CPU-SEC.
                     159 ELAPSED-SEC.
                                           52
     8 CPU-SEC.
                     160 ELAPSED-SEC.
                                           52
                                                PARTN
                                                        END
                                                DECOMP
      B CPU-SEC.
                                                        BEGN
                      160 ELAPSED-SEC.
                                           55
                                           DECO MP
     8 CFU-SEC.
                      161 ELAPSED-SEC.
     8 CPU-SEC.
                      162 ELAPSED-SEC.
                                           DECG MP
     8 CPU-SEC.
                     164 ELAPSED-SEC.
                                           55
                                                 DECOMP END
      8 CPU-SEC.
                     165 ELAPSED-SEC.
                                           ---- LINKNSO5 ---
   118 I/O SEC.
LAST LINK DID NOT USE 59592 BYTES OF OPEN CORE
      B CPU-SEC.
                     167 ELAPSED-SEC.
                                          ---- LINK END ---
      8 CPU-SEC.
                     167 ELAPSED-SEC.
                                           59
                                                 SSG1
                                                         BEGN
      8 CPU-SEC.
                     171 ELAPSED-SEC.
                                           59
                                                 3SG1
                                                         END
      a CPU-SEC.
                     172 ELAPSED-SEC.
                                                 SSG2
                                                         BEGN
```

```
8 CPU-SEC.
                  173 ELAPSED-SEC.
                                      MPYA D
                                            METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                     0.0
     B CPU-SEC.
                  174 ELAPSED-SEC.
                                      MPYA D
     8 CPU-SEC.
                  177 ELAFSED-SEC.
                                      MPYA D
                                           METHOD 2 NT, NBR PASSES = 1.EST. TIME =
                                                                                     0.0
     8 CPU-SEC.
                   178 ELAPSED-SEC.
                                      MPYA C
                   178 ELAPSED-SEC.
     9 CPU-SEC.
                                      63 SSG2
                                                 END
     9 CPU-SEC.
                                      66 $SGHT BEGN
                   178 ELAPSED-SEC.
     9 CPU-SEC.
                                      66 SSGHT END
                   193 ELAPSED-SEC.
     9 CPU-SEC.
                  '94 ELAPSED-SEC.
                                     ---- LINKNSOS ---
= 152 I/O SEC.
LAST LINK DID NOT USE 24432 BYTES OF OPEN CORE
     9 CPU-SEC.
                   200 ELAPSED-SEC. ---- LINK END ---
     9 CPU-SEC.
                                     71 PLTTRAN BEGN
                   2CO ELAPSED-SEC.
                                    71 PLTTRAN END
     9 CPU-SEC.
                   201 ELAPSED-SEC.
                                    ---- LINKNS13 ---
     9 CPU-SEC.
                   201 ELAPSED-SEC.
■ 159 I/O SEC.
LAST LINK DID NOT USE 73552 BYTES OF OPEN CORE
     9 CPU-SEC.
                   207 ELAPSED-SEC. ---- LINK END ---
                                     74 SDR2 BEGN
     9 CPU-SEC.
                   207 ELAPSED-SEC.
                                    74 SDR2 END
     9 CPU-SEC.
                   210 ELAPSED-SEC.
                   210 ELAPSED-SEC. ---- LINKNS14 ---
     9 CPU-SEC.
= 167 I/O SEC.
LAST LINK DID NOT USE 25468 BYTES OF OPEN CORE
   10 CPU-SEC.
                   216 ELAPSED-SEC.
                                    ---- LINK END ---
    10 CPU-SEC.
                   216 ELAPSED-SEC.
                                     75 OFP
                                                SEGN
    10 CPU-SEC.
                                   75 OFP
                   217 ELAPSED-SEC.
                                                   EN:D
   10 CPU-SEC.
                 2-8 ELAPSED-SEC.
                                   ---- LINKNS13 ---
= 175 I/O SEC.
LAST LINK DID NOT USE 68004 BYTES OF OPEN CORE
    10 CPU-SEC.
               225 ELAPSED-SEC. ---- LINK END ---
                                     77 SDRHT BEGN
    10 CPU-SEC.
                   225 ELAPSED-SEC.
                                   77 SDRHT END
  10 CPU-SEC.
                   225 ELAPSED-SEC.
  10 CPU-SEC.
                   225 ELAPSED-SEC.
                                     ---- LINKNS14 ---
≈ 185 I/O SEC.
LAST LINK DID NOT USE 39888 BYTES OF OPEN CORE
   10 CPU-SEC.
               235 ELAPSED-SEC. ---- LINK END ---
                                    78 OFP
    10 CPU-SEC.
                   235 ELAPSED-SEC.
                                                BEGN
   10 CPU-SEC.
                   235 ELAPSED-SEC.
                                    78
                                           OFP
                                                   END
                                           EXIT
                                                   BEGN
  10 CPU-SEC.
                   236 ELAPSED-SEC.
                                      92
≠ 187 I/O SEC.
```

LAST LINK DID NOT USE 74704 BYTES OF OPEN CORE AMOUNT OF OPEN CORE NOT USED = OK BYTES

МИМИМИМИМИМИМИМИМ

IBM 360-370 SERIES NEW YIGHTADARDARANGA PURANG SARENAM WIGHMANAM MINING MESANDA DARAK KUMARA YILONG MINI MODELS 91,95 MORROWAND AND ARREST AND ARREST ARRES MARANAMAN INJAMPARAN MERINAMANAMAN MENANGENGANAN PERINASAN ANA MENANGENTAN MENANGENTAN MENANGENTAN MENANGENTAN MEASUMMEMME INTO MARKET MARKET AND A STATE OF THE STATE O AMERICAN PRODUCTION OF THE PROPERTY OF THE PRO RIGID FORMAT SERIES M LEVEL 15.5.3 MMSGROW MINIMARKAN AGRANACIO DE MINIMARKAN MARKAN ACCIDENTA MARKAN MARIKAN MARKAN MARKAN MARKAN MARKAN MARKAN MARKAN MARKAN MARKAN MARK MINISTER MARKET MOMENTANION APAPARATAN MMMGMMMMM /MM --MMMM MMMMMM MM MMMMMM MMMMM MMMMM DAMMADAMAM /// M MM--MMM MANAMARM MIMMMMMM MMMMMM/// MMM MMM М MMM MMMM MMMM MM MISS SWAMMAN MMMMM MANAMINIAM M 11/1/1// MMMMM - - MMMMM MMMMMMMM M MMM MM MMM MMMMM MM MMMMWMWMM M SiMN MDMM// /// /////MMM MAMMA - - MMMAMM MMMMMMM MMM М MMM MM MMMM MM MMMMVMMMM MM 1111 111 MINIMANIA - - - M MINIMANIA MMAGAIMMM M MMM MM MMMM MM MMMM MM MINIMARKINE MARINI MMMM / /// ///MM MMMMMMMM - - - M MMMAMMM MMNUMMIMM MMMMMM M MMMM MM MMMMMMM MANAGEMENTALIAM // M MMMM - - - MMMMI MMMMM MANAGEMENT M MMM MMMMMMMMMM MM MMMMM 11111 MEAN MANAMAM M MMMM MM MM////// MMM - - - · MMMM MMN MMM M MMM MM MMMM MMMM MMMMM1 ////MMA'M\\M MADEMIAN DE CAMA MMMMMM - - - - M MM MMM MM MMMM MMMMMM MMMM MM MMM MMMMMM MEANAGHEANNAM MEANAGHAINMANAM MANAGHAINMAM - - - - MM - M - - - - MM MANAGHAINMANAM MINISTER MANAGHAINMANAM MANAGHAINMANAM MANAGHAINMANAM MANAGHAINMAN MANAGHAIN MANAGHAIN MANAGHAIN MANAGHAIN MANAGHAIN MANAGHAIN MANAGHAI MMMMMMAGMAGA CAMMININGS PROBLEMS IN - - MMCGAMM MIANDERSHADAMMANAMPANMANAMM MAINAMA MIAMAMM MMMMMMMVALMSVARIA DE DOMA - - - DAMKDARSAMI MINORPORTO DE PAGAMILAMINA MINOR MANAGORIA DE PAGAMINA MMRAMOREM MAY OF HONE - R. O'GRIMMAN AND READ REPRESENTATION OF THE MAY AND THE RESERVE OF THE MAY AND THE PROPERTY OF THE PRO MISSAMBRAMBRANCA - - PRANCER SERVICA S SYSTEM GENERATION DATE - 12/31/74 IMMANUARAM - - MANAMANI MANAMANIANAMANAMANIANAMANAMANIA MMMMMMMMMM - MMRIORE MASCASSIC ACCORDAGIO MANAGAMENTA MANAGAMINA MANAGAMINA MANAGAMINA MANAGAMINA MANAGAMINA MANAGAMINA M ARCHER RESEARCH CONTROL OF THE CONTR

> MANAGAMATAN MANAGA MARIAM MARIAMAN MARIA

```
$ START OF EXECUTIVE CONTROL *******************************
  ID CLASS PROBLEM SEVEN, C.E. JACKSON
  $ MAXIMUM CPU TIME ALLOWED FOR THE JOB
  $
  TIME 10
  $ THE THERMAL ANALYZER PORTION OF NASTRAN IS TO BE, USED
  APP HEAT
  $ THE NON-LINEAR STEADY-STATE SOLUTION ALGORITHM IS TO BE USED
  SOL 3
  $ REQUEST FOR DIAGNOSTIC WHICH PRINTS OUT CONVERGENCE CRITERIA
  $ PRODUCES OUTPUT ONLY FOR SOL 3
  DIAG 18
CEND
```

PAGE

CASE CONTROL DECK ECHO

NON-LINEAR STEADY-STATE PROBLEM ... H = F(T)

```
CARD
COUNT
1
      S END OF EXECUTIVE CONTROL --- START CASE CONTROL ******************************
      Sibrirring
      TITLE= NON-LINEAR STEADY-STATE PROBLEM ... H = F(T)
      S SPECIFY 51 LINES OF DATA PER PAGE (DOES NOT INCLUDE HEADINGS AT TOP OF PAGE)
G
      LINE=51
10
11
12
      $ REQUEST SORTED AND UNSORTED OUTPUT
      $ IF THIS CARD IS OMITTED, ONLY THE SORTED BULK DATA WILL APPEAR
13
14
15
      ECHO=EOTH
16
      5
17
      S SELECT THE SPC. MPC. AND LOAD SETS TO BE USED IN THIS SOLUTION
18
19
      SPC=100
20
      MPC = 200
21
      LOAD=300
22
      S SELECT THE TEMPERATURE SET WHICH IS AN ESTIMATE OF THE FINAL SOLUTION VECTOR
23
24
25
      TEMPIMATERIAL)=400
26
      S SCLECT THE OUTPUT DESIRED (TEMPERATURES, LOADS, AND CONSTRAINT POWERS)
27
28
29
      OUTPUT
30
      THERMAL=ALL
31
      OLOAD=ALL
32
      SPCF=ALL
33
34
      5 END CASE CONTROL --- START BULK DATA ******************************
35
      36
37
38
      BEGIN BULK
```

INPUT BULK DATA DECK EÇHO

```
1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 .
S UNITS MUST BE CONSISTENT
$ IN THIS PROBLEM, METERS. WATTS, AND DEGREES CELSIUS ARE USED
$ DEFINE GRID POINTS
$
GPID
                               Ο.
                                       О.
                       Ο.
GRID
        2
                       . 1
                               О.
                                       0.
GRID
        3
                        . 2
                               0.
                                       ο.
GRID
        4
                       . з
                               ٥.
                                       n.
GRID
        5
                       Ο.
                                       ٥.
                               . 1
GRID
        6
                        . 1
                                       ο.
GRID
       7
                        . 2
GRID
        8
                        . з
                               . 1
GRID
        9
                       0.
                                . 2
                                       0.
GRID
        10
                       Ο.
                               - . 1
                                       Ο.
GRID
       100
                       - . 05
                                .05
                                       Ο.
$ CONNECT GRID POINTS
CROD
       10
                100
                       10
                               2
CROD
        20
                100
                        9
                                6
COUAD2 30
                200
                                2
                                       6
                                               5
                        1
CQUAD2 40
                200
CQUAD2 50
                200
5 DEFINE CROSS-SECTIONAL AREAS AND/OR THICKNESSES
$
PROD 100
                1000
                        .001
PQUAD2 200
                1000
                        .01
$ DEFINE MATERIAL THERMAL CONDUCTIVITY
$
MAT4
       1000
                200.
                                                                       ALUMINUM
$ DEFINE CONVECTIVE AREA AND CONVECTIVE COEFFICIENT 'H'
S
CHBDY
        60
                300
                        LINE
                                                                       +CONVEC
+CONVEC 100
                100
PHBDY
        300
                3000
                        .314
MAT4
        3000
                200.
S DEFINE CONSTRAINTS
$
MPC
        200
                9
                                1.
                                                       -1.
MPC
        200
                10
                                1.
                                                       -1.
S DEFINE APPLIED LOADS
SLOAD
        300
                        4.
                                2
                                        8.
                1
```

S

```
INPUT BULK DATA DECK ECHO
                               5 ..
                                      6 .. 7 .. 8 .. 9 .. 10 .
SLOAD
      300
             3
                    8.
SLOAD
      300
             5
                    4.
                           6
                                  8.
SLOAD
      300
             7
                    8.
                           8
                                  4.
.
S THE FOLLOWING BULK DATA CARDS WERE ADDED TO CONVERT PROBLEM ONE TO
S PROBLEM TWO. THE ONLY BULK DATA CARD REMOVED FROM THE PREVIOUS SOLUTION WAS
S THE SPC CARD
$ THIS SPC1 CARD REPLACES THE SPC CARD REMOVED FROM ABOVE
SPC1 100 1
                    100
5
S RADIATION BOUNDARY ELEMENTS
CHBDY
      200
             2000
                     AREA4 1
CHBDY
      300
             2000
                     AREA4 2
                                  3
CHEDY
      400
                    AREA4 3
             2000
                                         8
                     AREA4
CHEDY
      500
             2000
                          5
                                         2
                                                1
                    AFEA4
                                         3
                                                2
CHEDY
      600
             2000
                           6
                                  7
CHBDY 700
             2000
                     AREA4
                           7
                                         4
$ EMISSIVITY OF RADIATING ELEMENT
s
PHBDY 2000
S ESTIMATE OF FINAL STEADY STATE SOLUTION VECTOR --- REFERENCED
$ BY TEMP(MATERIAL) IN CASE CONTROL
TEMP
       400
             100
                     300.
TEMPD 400
             300.
$
S PARAMETERS CONTROLLING RADIATION LOADING AND THE ITERATION LOOPING
S
PARAM TABS
             273.15
PARAM SIGMA 5.685E-8
PARAM MAXIT B
            .0001
PARAM EPSHT
S DEFINITION OF THE RADIATION MATRIX
S ALL OF THE RADIATION GOES TO SPACE
RADLST 200
              300
                     400
                            500
                                  600
                                         700
RADMIX 1
             Ο.
                     ٥.
                           0.
                                  ٥.
                                         0.
                                                0.
                    ο.
                           ٥.
                                         Ο.
RADMTX 2
             0.
                                  Ο.
RADMIX 3
             ٥.
                    0.
                           Ο.
                                  ٥.
PADMIX 4
             ο.
                    0.
                           0.
FADMTX 5
                     O.
             Ο.
RADMTX 6
             Ο.
```

"OTAL COUNT= 120

5

INPUT BULK DATA DECK ECHO

. 1 .. 2 .. 3 .. 4 .. 5 . 6 .. 7 .. 8 .. 9 .. 10 . \$ THE FOLLOWING BULK DATA CARDS WERE ADDED TO CONVERT PROBLEM TWO \$ TO PROBLEM SEVEN. PROBLEM SEVEN HAS THE CONVECTIVITY AS A FUNCTION S OF TEMPERATURE. \$ MAKE THE CONVECTIVITY OF MAT4 CARD 3000 TEMPERATURE DEPENDENT. \$ AT A TEMPERATURE OF 200 C. THE CONVECT 'ITY WILL BE 200 WATTS/MT-MT-C. \$ AT A TEMPERATURE OF 300 C. THE CONVECTIVITY WILL BE 250 WATTS/MT-MT-C. MATT4 3000 2000 TABLEM1 2000 +TM1 +TM1 200. 1. 300. 1.25 ENDT \$ ENDDATA

*** USER INFORMATION MESSAGE 207, BULK DATA NOT SORTED.XSORT WILL RE-ORDER DECK.

PAGE

CARD	
COUNT 1 2 3 4 5 6 7 8	9 10
1- CHBDY 60 30C LINE 1 5	+CONVEC
2- +CONVEC 100 100	
3- CHBDY 200 2000 AREA4 1 2 6 5	
4- CHBDY 3CO 2000 AREA4 2 3 7 6	
5- CHBDY 400 2000 AREA4 3 4 8 7	
6- CHBDY 500 2000 AREA4 5 6 2 1	
7- CHBDY 600 2000 AREA4 6 7 3 2	
8- CHBDY 700 2000 AREA4 7 8 4 3	
9- CQUAD2 30 200 1 2 6 5	
10- CQUAD2 40 200 2 3 7 6	
11- CQUAD2 50 260 3 4 8 7	
12- CROD 10 100 10 2	
13- CROD 20 100 9 6	
14- GRID 1 0.0 0.0 0.0	
15- GRID 2 .1 0.0 0.0	
16- GRID 3 .2 0.0 0.0	
17- GRID 4 .3 0.0 G.0	
18- GRID 5 0.0 .1 0.0	
19- GRID 6 .1 .1 0.0	
20- GRID 7 .2 1 C.O	
21- GRID 8 .3 .1 0.0	
22- GRID 9 0.0 .2 0.0	
23- GRID 10 0.01 0.0	
24- GRID 10005 .05 0.0	
25- MAT4 1000 200.	ALUMINUM
26- MAT4 3000 206.	
27- MATT4 3000 2000	
28- MPC 200 9 1 1. 5 1 -1.	
29- MPC 200 10 1 1. 1 1 -1.	
30- PARAM EPSHT .0001	
31- PARAM MAXIT B	
32- PARAM SIGMA 5.685E-8	
33- PARAM TABS 273.15	
34- PHEDY 300 3000 .314	
35- PHBDY 2000 .90	
36- PQUAD2 200 1000 .01	
37- PROD 100 1000 .001	
38- RADLST 200 300 400 500 600 700	
39- RADMIX 1 0.0 0.0 0.0 0.0 0.0	
40- RADMIX 2 0.0 0.0 0.0 0.0	
41- RADMIX 3 0.0 0.0 0.0 0.0	•
42- RADWIX 4 0.0 0.0 0.0	
43- RADMIX 5 0.0 0.0	
44- RADMIX 6 0.0	
45- SLOAD 300 1 4. 2 8.	
46- S!OAD 300 3 8. 4 4.	
47- SLCAD 300 5 4. 6 A.	
48- SLCAD 300 7 8. 8	•
49- SPC1 1CO 1 100	
50- TABLEM1 2000	+TM1
51- +TM1 200. 1. 300. 1.25 ENDT	

PAGE

```
SORTED BULK DATA ECHO
```

CARD
COUNT 1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 .
52- TEMP 400 100 300.
53- TEMPD 400 300.
ENDDATA

NO ERRORS FOUND - EXECUTE NASTRAN PROGRAM

*** USER INFORMATION MESSAGE FULL INTERNAL SPACE NODE AVAILABLE

*** USER INFORMATION MESSAGE . 6 ELEMENTS HAVE A TOTAL VIEW FACTOR (FA/A) LESS THAN 0.99

*** USER INFORMATION MESSAGE 3023, B = 3 C = 0 R = 2

1

*** USER INFORMATION MESSAGE 3027, SYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

*** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKFF HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET • 1

*** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKSF HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2

*** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKFS
HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2

*** SYSTEM WARNING MESSAGE 2169. THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKSS HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 1

*** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HRFN HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2

*** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HRSN HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2

*** USER INFORMATION MESSAGE 3028, B = 4 BBAR = 5
C = 3 CBAR = 0
R = 7

*** USER INFORMATION MESSAGE 3027, UNSYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

DIAG 18 OUTPUT FROM SSGHT

ITERATION	EPSILON-P	LAMBDA-1	EPSILON-T
=======================================		=======================================	#=====================================
1	6.318074E-02		
2	5.1904282-03	1.240634E 01	6.380256E-04
3	9.369841E-04	5.662853E 00	2.75135GE-04
4	1.789647E-04	5.290874E 00	5.648893E-05

*** USER INFORMATION MESSAGE 3086, ENTERING SSGHT EXIT MODE BY REASON NUMBER 1 (NORMAL CONVERGENCE)

NON-LINEAR STEADY-STATE PROBLEM ... H = F(T) JANUARY 1, 1976 NASTRAN 12/31/74 PAGE

TEMPERATURE VECTOR

POINT ID.	TYPE	ID VALUE	ID+1 VALUE	ID+2 VALUE	ID+3 VALUE	ID+4 VALUE	ID+S VALUE
1	S	2.786384E 02	2.519288E 02	2.181912E 02	2.079060E 02	2.786384E 02	2.519288E 02
7	S	2.181912E 02	2.079060E 02	2.786384E 02	2.786384E C2		
100	S	3.000000E 02					

NON-LINEAR STEADY-STATE PROBLEM ... H = F(T)

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LOAD VECTOR

POINT ID.	TYPE	ID VALUE	ID+1 VALUE	ID+2 VALUE	ID+3 VALUE	ID+4 VALUE	ID+5 VALUE
1	S	4.000COOE 00	8.000000E 00	8.00C000E 00	4.000000E 00	4.000000E 00	8.000000E 00
7	S	8.000000E 00	4.000000E 00				

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FORCES OF SINGLE-POINT CONSTRAINT

POINT ID. TYPE ID VALUE ID+1 VALUE ID+2 VALUE ID+3 VALUE ID+4 VALUE ID+5 VALUE 100 S 1.641228E 02

```
NASTRAN LOADED AT LOCATION DEAF20.
TIME TO GO = 59 CPU SEC., 239 1/0 SEC.
     O CPU-SEC.
                        O FLAPSED-SEC.
                                            SEMI
                                                  BEGN
     O CPU-SEC.
                        O FLARSED-SEC.
                                            SEMT
     O CPU-SEC.
                        2 ELAPSED-SEC.
                                            NAST
     O CPU-SEC.
                        2 FLARSED-SEC.
                                            GNET
     O CPU-SEC.
                        2 ELAPSED-SEC.
                                            XCSA
     O CPU-SEC.
                        3 FLAPSED-SEC.
                                            IFP1
     O CPU-SEC
                        6 ELAPSED-SEC.
                                            XSOR
     1 CPU-SEC.
                       10 ELAPSED-SEC.
                                              DO
                                                  TEP
     1 CPU-SEC.
                       24 ELAFSED-SEC.
                                             END
                                                  ! FP
     1 CPU-SEC.
                       24 ELAPSED-SEC.
                                            XGPI
     3 CPU-SEC.
                       30 FLAPSED-SEC.
                                            SEM1
                                                  LINKNSO2 ---
     3 CPU-SEC.
                       30 FLARSED-SEC.
                                            ----
    22 I/O SEC.
LAST LINK DID NOT USE
                             C BYTES OF OPEN CORE
     3 CPU-SEC.
                       32 ELAPSED-SEC.
                                                  LINK END ---
     3 CPU-SEC.
                       32 ELAPSED-SEC.
                                            XSFA
     3 CPU-SEC.
                       53 FLAPSED-SEC.
                                            XSFA
     3 CPU-SEC.
                       US ELAPSED-SEC.
                                                  GP1
                                                           BEGN
                       IS FLAPSED-SEC.
                                                  GP1
                                                           END
     3 CPU-SEC.
     3 CPU-SEC.
                       19 ELAPSED-SEC.
                                                  GP2
                                                           BEGN
                       40 E: APSED-SEC.
                                                  GP2
                                                           END.
     3 CPU-SEC.
                                            5
     3 CPU-SEC.
                       4.0 ELAPSED-SEC.
                                            7
                                                  PLISFI
                                                           BEGN
     3 CPU-SEC.
                       41 ELAPSED-SEC.
                                                  PLTSET
                                                           END
                                                   PRIMISG
                                                           SEGN
     3 CPU-SEC.
                       W1 FILESED-SEC.
                                            9
     3 CPU-SEC.
                       #2 ELAPSED-SEC.
                                            9
                                                  PRIMSG
                                                           FND
     3 CPU-SEC.
                       KR ELAPSED-SEC.
                                            10
                                                  SETVAL
                                                           BEGN
     3 CPU-SEC.
                       42 ELAPSED-SEC.
                                            10
                                                  SETVAL
                                                           E1.D
                       43 ELAPSED-SEC.
                                            18
                                                   G23
                                                           BEGN
     3 CPU-SEC.
     3 CPU-SEC.
                       53 ELAPSED-SEC.
                                            18
                                                  GP3
                                                           END
     3 CPU-SEC.
                       53 ELAPSED-SEC.
                                            20
                                                  T \Delta 1
                                                           REGN
                       62 ELAPSED-SEC.
                                            20
                                                  TA1
                                                           END
     3 CPU-SEC.
     3 CPU-SEC.
                       63 ELAPSED-SEC.
                                                  LINKNSG3 ---
    52 I/O SEC.
LAST LINK DID NOT USE
                       41828 BYTES OF OPEN CORE
                                            ---- LINK END ---
     4 CPU-SEC.
                       66 ELAPSED-SEC.
     4 CPU-SEC.
                       66 ELAPSED-SEC.
                                            24
                                                   SMA1
                                                           BEGN
     4 CPU-SEC.
                       69 ELAPSED-SEC.
                                                   SMA1
                                                           END
                       70 ELAPSED-SEC.
                                                  LINKNSO5 ---
     4 CPU-SEC.
    57 I/O SEC.
                         23308 BYTES OF OPEN CORE
LAST LINK DID NOT USE
     4 CPU-SEC.
                       80 ELAPSED-SEC.
                                            ----
                                                  LINK END ---
                                            27
                                                   RMG
     4 CPU-SEC.
                       80 ELAPSED-SEC.
                                            SDCO
                                                  MP
     4 CPU-SEC.
                       84 ELAPSED-SEC.
                                            SDCO
                                                  MP
     4 CPU-SEC.
                       84 ELAPSED-SEC.
     4 CPU-SEC.
                       86 ELAPSED-SEC.
                                            FBS
     4 CPU-SEC.
                       88 ELAPSED-SEC.
                                            FBS
     4 CPU-SEC.
                       89 ELAPSED-SEC.
                                            MPYA
                                                  METHOD 2 NT. NBR PASSES # 1.EST, TIME #
                                                                                                   0.0
                                            MPYA
     4 CPU-SEC.
                       90 ELAPSED-SEC.
     4 CPU-SEC.
                       90 ELAPSED-SEC.
                                            TRAN
                                                  POSE
     4 CPU-SEC.
                       92 ELAPSED-SEC.
                                            TRAN
                                                  POSE
                                            MPYA D
     4 CPU-SEC.
                       92 ELAPSED-SEC.
                                                                                                   0.0
                                                  METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                            MPYA
     4 CPU-SEC.
                       94 ELAPSED-SEC.
```

```
4 CPU-SEC.
                       96 ELAPSED-SEC.
                                            27
                                                  RMG
                                                          END
                                                  LINKNSO4 ---
     4 CPU-SEC.
                       98 ELAPSED-SEC.
    73 I/O SEC.
LAST LINK DID NOT USE 3156C BYTES OF OPEN CORE
                                                 LINK END ---
     4 CPU-SEC.
                      102 ELAFSED SEC.
                                            ----
                                                          BEGN
     4 CPU-SEC.
                      102 ELAPSED-SEC.
                                            32
                                                  GP4
                                                  GF4
                      107 ELAPSED-SEC.
                                            32
                                                          END
     4 CPU-SEC.
                                                  GPSP
                                                          BEGN
     5 CPU-SEC.
                      108 ELAPSED-SEC.
                                            38
                                                  GPSP
                                                          END
     5 CPU-SEC.
                      109 ELAPSED-SEC.
                                            38
     5 CPU-SEC.
                      (9 ELAPSED-SEC.
                                            ----
                                                  LINKNS14 ---
    84 I/O SEC.
LAST LINK DID NOT USE 76084 BYTES OF OPEN CORE
     5 CPU-SEC.
                      1:3 ELAPSED-SEC.
                                            ---- LINK END ---
     5 CPU-SEC.
                      113 ELAPSED-SEC.
                                            39
                                                  OFP
                                                           BEGN
                      113 ELAPSED-SEC.
                                            39
                                                  OFP
                                                           END
     5 CPU-SEC.
                                            ---- LINKNS04 ---
                      115 ELAPSED-SEC.
     5 CPU-SEC.
    88 I/O SEC.
LAST LINK DID NOT USE 74704 BYTES OF OPEN CORE
     5 CPU-SEC.
                      117 ELAFSED-SEC.
                                            ---- LINK END ---
                                            42
                                                  MCE1
     5 CPU-SEC.
                      117 ELAPSED-SEC.
                                                           BEGN
                                            42
                                                  MCE1
                                                           END
     5 CPU-SEC.
                      120 ELAPSED-SEC.
                                                  MCE2
                                                           BEGN
     5 CPU-SEC.
                      120 ELAPSED-SEC.
                                            44
     5 CPU-SEC.
                      122 ELAPSED-SEC.
                                            MPYA
                                                  D
                                                  METHOD 2 NT, NBR PASSES = 1, EST. TIME =
                                                                                                  0.0
     5 CPU-SEC.
                      123 ELAPSED-SEC.
                                            MPYA
     5 CPU-SEC.
                      124 ELAPSED-SEC.
                                            MPYA
                                                                                                   0.0
                                                  METHOD 2 T .NBR PASSES =
                                                                              1.EST. TIME =
                                            MPYA
                                                  D
     5 CPU-SEC.
                      125 ELAPSED-SEC.
     5 CPU-SEC.
                      125 ELAFSED-SEC.
                                            MEYA
                                                                                                   0.0
                                                   METHOD 2 T .NER PASSES =
                                                                               1.EST. TIME =
     6 CPU-SEC.
                      :26 ELAPSED-SEC.
                                            MPYA
     ô CPU-SEC.
                      128 ELAPSED-SEC.
                                            MPYA
                                                  D
                                                  METHOD 2 NT. NER PASSES =
                                                                               1.EST. TIME =
                                                                                                   0.0
     6 CPU-SEC.
                      129 ELAPSED-SEC.
                                            MPYA
                                                  D
     6 CPU-SEC.
                      129 ELAPSED-SEC.
                                            MPYA
                                                   METHOD 2 T , NBR PASSES =
                                                                               1.EST. TIME =
                                                                                                   0.0
      6 CPU-SEC.
                      130 ELAPSED-SEC.
                                            MPYA
     7 CPU-SEC.
                      130 ELAPSED-SEC.
                                            MPYA
                                                                                                   0.0
                                                   METHOD 2 T .NBR PASSES = 1.EST. TIME =
     7 CPU-SEC.
                      132 ELAPSED-SEC.
                                            MPYA
                                                  D
                      132 ELAPSED-SEC.
                                                  MCE2
     7 CPU-SEC.
                                            44
                                            ---- LINKNS07 ---
      7 CPU-SEC.
                      133 ELAPSED-SEC.
   107 I/O SEC.
LAST LINK DID NOT USE 68372 BYTES OF OPEN CORE
                      138 ELAPSED-SEC.
     7 CPU-SEC.
                                            ----
                                                  LINK END ---
      7 CPU-SEC.
                       138 ELAPSED-SEC.
                                            50
                                                   VEC
                                                           BEGN
                                                   VEC
                                                           END
      7 CPU-SEC.
                      138 ELAPSED-SEC.
                                            50
     7 CPU-SEC.
                      139 ELAPSED-SEC.
                                            51
                                                   PARTN
                                                           BEGN
      7 CPU-SEC.
                      1.11 ELAPSED-SEC.
                                            51
                                                   PARTN
                                                           END
                                            XSFA
      7 CPU-SEC.
                      1:11 ELAPSED-SEC.
      7 CPU-SEC.
                      1.12 ELAPSED-SEC.
                                            XSFA
                                                   FARTN
                                                           BEGN
      7 CPU-SEC.
                      142 ELAPSED-SEC.
                                            52
      7 CPU-SEC.
                      144 ELAPSED-SEC.
                                            52
                                                   PARTN
                                                           EN:D
      7 CPU-SEC.
                       144 ELAPSED-SEC.
                                            55
                                                   DECOMP
                                                           BEGN
      7 CPU-SEC.
                      144 ELAPSED-SEC.
                                            DECO
                                                  MP
      7 CPU-SEC.
                      146 ELAPSED-SEC.
                                            DECO
                                                  MP
      7 CPU-SEC.
                      148 ELAPSED-SEC.
                                            55
                                                   DECOMP END
      7 CPU-SEC.
                      149 ELAPSED-SEC.
                                            ----
                                                  LINKNSO5 ---
   118 I/O SEC.
 LAST LINK DID NOT USE 595% SYTES OF OPEN CORE
      7 CPU-SEC.
                      151 ELAPSED-SEC.
                                            ---- LINK END ---
      7 CPU-SEC.
                                                           BEGN
                      15: ELAPSED-SEC.
                                            59
                                                   SSG1
      7 CPU-SEC.
                      155 ELAPSED-SEC.
                                            59
                                                   SSG1
                                                           END
```

63

SSG2

BEGN

157 ELAPSED-SEC.

7 CPU-SEC.

```
7 CPU-SEC
                 159 ELAPSED-SEC.
                                    MPYA D
                                         METHOD 2 T NSR PASSES = 1 EST TIME =
    B CPH-SEC
                  160 FLARSED-SEC
                                    MOVA D
    A CRU-SEC
                  162 FLARSED-SEC.
                                    L'DVA D
                                        NETHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                0.0
                                    LEYA D
    R CPU-SEC
                  163 FLARSED-SEC.
    8 CPU-SEC.
                 163 FLAPSED-SEC.
                                    63 SSG2
                                                END
                                         SSGHT BEGN
    8 CPH-SEC
                 103 FLARSED-SEC
                                    66
                 .82 ELAPSED-SEC.
    B CPU-SEC
                                    66 SSGHT END 1
    B CPU-SEC.
                183 FLAPSED-SEC.
                                   ---- LINKNSOR ---
= 154 I/O SEC.
LAST LINK DID NOT USE 24408 BYTES OF OPEN CORE
    R CPULSEC
               190 ELAPSED-SEC
                                   ---- IINK FND - -
    B CPII-SEC
                190 FLAPSED-SEC.
                                    71 PLITTRAN BEGN
    8 CPU-SEC.
                                 71 PLTTRAN FND
               191 FLAPSED-SEC.
                                 ---- IINKNS13 ---
   8 CPU-SEC
                191 ELAPSED-SEC.
 160 I/O SEC.
LAST LINK DID NOT USE 73552 BYTES OF OPEN CORE
   9 CPU-SEC. 197 ELAPSED-SEC. ---- LINK END ---
                                    74 SDR2 BEGN
    9 CPU-SEC.
                  197 ELAPSED-SEC.
                                 74 SDR2 BEGN
74 SDR2 END
---- LINKNS14 ---
    9 CPU-SEC.
                  200 ELAPSED-SEC.
    9 CPU-SEC.
                  200 FLAPSED-SEC.
= 169 I/O SEC
LAST LINK DID NOT USE 25468 BYTES OF OPEN CORE
    9 CPU-SEC. 206 ELAPSED-SEC. ---- LINK END ---
                                 75 OFP BEGN
    9 CPU-SEC.
                 206 ELAPSED-SEC.
   9 CPU-SEC.
                213 FLARSED-SEC. 75 OFP
                                              END
                2'4 ELAPSED-SEC. ---- LINKNS13 ---
   9 CPU-SEC.
= 177 I/O SEC.
LAST LINK DID NOT USE 68004 BYTES OF OPEN CORE
                                 ---- LINK END ---
    9 CPU-SEC.
               222 ELAPSED-SEC.
                 222 ELAPSED-SEC.
                                   77 SDRHT BEGN
    9 CPU-SEC.
               223 ELAPSED-SEC.
                                 77 SDRHT END
    9 CPU-SEC.
                                 ---- LINKNS14 ---
   9 CPU-SEC.
                223 F. APSED-SEC.
= 186 I/O SEC.
LAST LINK DID NOT USE 39888 BYTES OF OPEN CORE
    9 CPU-SEC. 234 ELAPSED-SEC. ---- LINK END ---
                                  78 OFP BEGN
    9 CPU-SEC.
                 234 ELAFSED-SEC.
  9 CPU-SEC.
                235 ELAPSED-SEC. 78 OFP
                                               C/13
                236 ELAPSED-SEC.
                                    92 EXIT
                                              EEGN
    9 CPU-SEC.
= 189 I/O SEC.
LAST LINK DID NOT USE 74704 BYTES OF OPEN CORE
```

AMOUNT OF OPEN CORE NOT USED - OK BYTES

PREMIUDINAL AND MARKET

ACAMATAY BUTTA AT THE ACT TO ACTION AS A CONTRACT MANAGER AND A CONTRACT AND ACTION AS A CONTRACT AS

AND IN A TERM OF THE PROPERTY OF THE PARTY O

MANARAMA LILLA ENTRE CALAR CAL

BY COMPRESSION OF CONTROLS STANDARD AND ADDRESS STORM OF THE STANDARD AND ADDRESS STANDARD AND ADDRESS STANDARD AND ADDRESS STANDARD AND ADDRESS ADDRESS AND ADDRESS ADDRESS AND ADDRESS ADDRESS ADDRESS AND ADDRESS A

MARIER GERHARDER DE AMERICA MELANAN BERMARAN BERMARAN BERMARAN MENDEN MARIER BANDAN MERIKAN MENDEN MARIER BERMARAN MENDEN MARIER BERMARAN BERMARAN MENDEN MARIER GERMARAN MENDEN
MESON PERCENTAGE AND PROPERTY OF A CONTROL O

MATTERNE BESTETTETTET E TEMPETET TOT OFFINE DE L'ALTERNE BESTETTETTET DE L'ALTERNE DES TRANSPORTES DE L'ALTERNE DE L'ALTER

MARIDAM STATES SESSIONE TAMMED SESSION DAY STATES SESSION SANCTON SESSION METALES MARINA ////// - PAMEDIAM MARINA MARINA SESSION DE
Mean assessment	PARMINIST	KW DWW	MARKATOR CREE		/MM	MM	MMN	IAMMI	MIV	MMM	MMM	1	MMMM
MINAMORICAGONIA	Magazia	MARKAMAM	MNS SIGNA///	/// M	$MM^2 - MMM$	MBM MBM	M	MMM	M	MMM	MMA	1₩	MM
MOMMANAMA	Maritan	MARKINAM M	11111111	MMMM M	Nor - NEWWORK	MMMMMMM	M	RANKS	M:M	MMM	MM	MASE	MM
MORESCE ASSISTS	M MAN	MSSMM// ///	////MNM	Manney -	- EMMINSM	MMNUUMM	M.	MOOM	M	MMM	MM	MMMM	MM
MANGANGANTALA	MM MYA	1111 111	NM 1 MVMT	10	MD 600-6 36M	SWALL MOSS	N.	1,74,767	MM	MATAM	MM	MIAIM	MM
MERCANDINAN	Mana	1 /1/ /// /// /// /// /// /// /// /// /	MANAGEMENT N	AM	W.W.Salaki	5753 5 56266	MANA	MMM	M	MMMM	MM	MMI	MMMM
IMMEMS MANAGEMENT	11111	// M	MMMMMM	- AMMAM	NH:SignM	DOMES MEAN	M N	WIN	MMMM	MMMAXMMM	MM	M:	MMMM
1454//////	MMMMMM 1	MAGMM MAGM	MM SAMMA	- MMIAM	M MMMM	NEWFORESTAND	M	MMM	MM	MMMM	MM	1	MMMM
////WWW.6286	MMEAN OF M	MW MMMM	V:M		MMC MMM	MATERIA.1	2256	Miles	MMMM	MMMMMM	MMM	Λ	MM

MARIAN MERUPA SEMANDAN DELIMPATO STADAM. INDRESORIO - - - NASCENTRA DIMENSIA MARIANDE MARIANDES ANTES ACOMISMEN MARIANDE CAMADO DEPARTE DEL RESPONDO DAME DAN - - - - DES CAMADAN MERUPA DA MONTE DE RECORDA ACOMISMEN MARIANDE CAMADO MARIANDE DE CONTRO ACOMISMO - - - - DES CAMADA DE DIMENSIA DE MARIANDE MARIAND

MICHAEL DE L'ARTER DE

MARKANIA UTAKU KANAMARIANIA MAKAMBARIA MAKAM

MARKARIANIMANA - - STAROVICA COLUMBICATOR A CALCANA MARKARIA MARKARIANA MARKA

MARMANA - - CONSTRAMEN TO MOTORIO CANTROLO SAS ACCUMANDO ANTO MARGO MATRIMA PRACTICAM PRODUCTA NAME - CONTRAMANA O CANTROLO SA MARMA MATRIMA MATRIMA CANTROLO MARMANA MATRIMA MATRIMA MATRIMA MATRIMA MATRIMA

- NAZOZETE DE DAMARANIA NA CONTRE EN ANCORO EN CONTRE EN ANCORO DE CONTRE EN ANCORD DE

MANAGAR DI CONTRACTO CONTROCTO DE CAMPANAMA MA CAMPANAMA DE CAMPANAMA

MEGAZIAN SIMPLEMENTALINAMAM

α

/////

SYSTEM GENERATION DATE - 12/31/74

IBM 360-370 SERIES

RIGID FORMAT SERIES M

LEVEL 15.5.3

MODELS 91.95

```
$
  $ START OF EXECUTIVE CONTROL *******************************
  ID CLASS PROBLEM EICHT, C.E. JACKSON
  $
  $ MAXIMUM CPU TIME # LLOWED FOR THE JOB
   S
  TIME 10
  $
  $ THE THERMAL ANALYZER PORTION OF NASTRAN IS TO BE USED
   $
  APP HEAT
   S THE NON-LINEAR STEADY-STATE SOLUTION ALGORITHM IS TO BE USED
   $
   SOL 3
   S REQUEST FOR DIAGNOSTIC WHICH PRINTS OUT CONVERGENCE CRITERIA
   $ PRODUCES OUTPUT ONLY FOR SOL 3
· DIAG 18
   CEND
```

CASE CONTROL DECK ECHO

```
CARD
COUNT
1
      2
     S END OF EXECUTIVE CONTROL --- START CASE CONTROL ******************************
      NON-LINEAR STEADY-STATE PROBLEM ... K = F(T) AND
6
     TITLE=
7
      SUBTITLE = K = ANISOTROPIC
8
9
      $ SPECIFY 51 LINES OF DATA PER PAGE (DOES NOT INCLUDE HEADINGS AT TOP OF PAGE)
10:
      $
11
     LINE=51
12
     $
      $ REQUEST SORTED AND UNSORTED OUTPUT
13
      S IF THIS CARD IS OMITTED. ONLY THE SCRIED BULK DATA WILL APPEAR
14
15
16
     ECHO=BOTH
17
     * SELECT THE SPC. MPC. AND LOAD SETS TO BE USED IN THIS SOLUTION
18
19
20
     SPC=100
21
     MPC=200
22
     1040=500
23
     S SELECT THE TEMPERATURE SET WHICH IS AN ESTIMATE OF THE FINAL SOLUTION VECTOR
24
25
26
     TEMP(MATERIAL)=400
27
      S SELECT THE CUTPUT DESIRED (TEMPERATURES, LOADS, AND CONSTRAINT POWERS)
28
29
30
     OUTPUT
3:
     THERMAL=ALL
32
     JJA=CA010
33
      SPCF=A11
34
35
      $ END CASE CONTROL --- START BULK DATA ***************************
36
      37
38
39
      BEGIN BULK
```

S

SLOAD 300

4.

1

2

8.

3

INPUT BULK DATA DECK ECHO 1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 \$ S UNITS MUST BE CONSISTENT \$ IN THIS PROBLEM, METERS. WATTS, AND DEGREES CELSIUS ARE USED S DEFINE GRID POINTS \$ Ο. GRID Ο. 0. 2 Ο. Ο. GRID . 1 GRID 3 . 2 0. . 3 GRID 4 0. Ο. CRID 5 0. О. . 1 GRID 0. . 1 . 1 GRID . 2 Ο. GRID . з . 1 Ο. GRID 0. . 2 Ο. 9 CRID Ο. - . 1 ο. 10 GRID -.05 . 05 100 Ο. 5 CONNECT GRID POINTS CROD 100 10 2 10 CROD 20 100 9 6 2 5 CQUAD2 30 200 1 6 CQUAD2 40 200 2 COUAD2 50 200 3 S DEFINE CROSS-SECTIONAL AREAS AND/OR THICKNESSES 1000 .001 PROD 100 PQUAD2 200 1000 .01 3 DEFINE MATERIAL THERMAL CONDUCTIVITY S MAT4 CARD REMOVED TO PERMIT ANISOTROPIC SPECIFICATION \$ DEFINE CONVECTIVE AREA AND CONVECTIVE COEFFICIENT 'H' CHEDY 60 300 LINE 1 +CONVEC +CONVEC 100 100 PHBDY 300 3000 .314 MAT4 3000 200. S S DEFINE CONSTRAINTS S MPC 200 1. -1. MPC 200 10 1. -1. S DEFINE APPLIED LOADS

NON-LINEAR STEADY-STATE PROBLEM ... K = F(T) AND

RADMIX 6

ο.

INPUT BULK DATA DECK ECHO 1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 . SLOAD 300 3 8. 4 4. 6 SLOAD 300 5 4. 8. SLOAD 300 7 8. 8 4. \$ THE FOLLOWING BULK DATA CARDS WERE ADDED TO CONVERT PROBLEM ONE TO \$ PROBLEM TWO. THE ONLY BULK DATA CAFD REMOVED FROM THE PREVIOUS SOLUTION WAS \$ THE SPC CARD \$ THIS SPC1 CARD REPLACES THE SPC CARD REMOVED FROM ABOVE \$ SPC1 100 1 100 S \$ RADIATION BOUNDARY ELEMENTS CHBDY 200 2000 AREA4 1 2 6 5 AREA4 CHBDY 300 2000 2 3 7 6 CHBDY 400 2000 AREA4 3 4 7 8 CHBDY 2000 AREA4 5 500 2 CHBDY 600 2000 APEA4 6 CHBDY 700 2000 ΔΡΕΔ4 7 8 3 S EMISSIVITY OF RADIATING ELEMENT PHBDY 2000 . 90 \$ ESTIMATE OF FINAL STEADY STATE SOLUTION VECTOR --- REFERENCED S BY TEMP(MATERIAL) IN CASE CONTROL Φ, TEMP 400 100 300. TEMPD 400 300. S PARAMETERS CONTROLLING RADIATION LOADING AND THE ITERATION LOOPING 5 PARAM TABS 273.15 PARAM SIGMA 5.685E-8 PARAM MAXIT 8 PARAM EPSHT .0001 S DEFINITION OF THE RADIATION MATRIX \$ ALL OF THE RADIATION GOES TO SPACE 5 RADLST 200 300 400 500 600 700 RADMTX 1 Ο. Ο. 0. ο. Ο. 0. RADMIX 2 ο. Ο. 0. ο. Ο. ٥. RADMTX 3 Ο. Ο. RADMIX 4 Ο. Ο. Ο. RADMIX 5 С. Ο.

INPUT BULK DATA DECK ECHO

. 1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 . S THE FOLLOWING BULK DATA CARDS WERE ADDED TO CONVERT PROBLEM TWO \$ TO PROBLEM EIGHT, PROBLEM EIGHT HAS CONDUCTIVITY S AS A FUNCTION OF TEMPERATURE, AND THE CONDUCTIVITY IS ANISOTROPIC ALSO 3 THE FOLLOWING CARD REPLACES MAT4 CARD 1000 IN THE BULK DATA MAT5 1000 200. 200. 5 THE CARDS AFTER IT SPECIFY THE TEMPERATURE DEPENDENCE MATT5 1000 5000 6000 +TM3 TABLEM1 5000 +1113 200. 300. 1.25 ENDT 1. +TM4 TABLEM1 6000 +T514 300. ENDT 200. Ο. Ο. \$ ENDDATA

"OTAL COUNT= 124

*** USER INFORMATION MESSAGE 207. BULK DATA NOT SORTED.XSORT WILL RE-UNDER DECK.

				S 0	RTED	виг	K DA	TAE	CHO		
C.	ARD										
C	OUNT	1	2	3	4	5	6	7	8 .	. 9	10 .
	1 -	CHBDY	60	300	LINE	1	5				+CONVEC
	2-	+CONVEC	100	100							
	3-	CHBDY	200	2000	AREA4	1	2	6	5 6		
	4 -	CHBDY	300	2000	APEA4	2	3	7	6		
	5-	CHBDY	400	2000	AREA4	3	4	8	7		
	6-	YGBHS	500	2000	AREA4	5	6	2	1		
	7 -	CHBDY	600	2000	AREA4	6	7	3	2		
	8-	CHEDY	700	2000	AREA4	7		4	3		
	9 -	CQUAD2	30	200	1	2	6	5			
	10-	CQUAD2	40	200	2	3	7	6			
	11-	CQUAD2	50	200	3	4	8	7			
	12-	CROD	10	100	10	2					
	13-	CROD	20	100	9	6					
	14-	GRID	1		0.0	0.0	C.O				
	15-	GRID	2		. 1	0.0	0.0				
	16-	GRID	3		. 2	0.0	0.0				
	17-	GRID	4		. 3	0.0	0.0				
	18-	GRID	5		0.C	. 1	0.0				
	19-	GRID	6		. 1	. 1	0.0				
	20-	GRID	7		. 2	. 1	0.0				
	21-	GRID	8		. 3	. 1	0.0				
	22-	GRID	9		0.0	. 2	0.0				
	23-	GRID	10		0.0	1	0.0				
	24-	GRID	100		05	. 05	0.0				
	25-	MAT4	3000	200.							
	26-	MAT5	1000	200.			200.				
	27-	MATT5	1000	5000			6000				
	28-	WDC	200	9	1	1.	5	1	. 1.		
rį.	29 -	MPC	200	10	1	1.	1	1	-1.		
	30-	PARAM	EPSHT	.0001							
	31-	PARAM	MAXIT	8	_						
	32 -	PARAM	SIGMA	5.685E-	8						
	33-	PARAM	TABS	273.15							
	34 -	PHBDY	300	3000	.314						
	35 -	PHEDY	2000			. 90					
	36-	PQUAD2	200	1000	.01						
	37-	PROD	100	1000	.001						
	38 -	RADLST	200	300	400	500	600	700			
	39-	RADMIX	1	0.0	0.0	0.0	0.0	0.0	0.0		
	40 -	RADMTX	2	0.0	0.0	0.0	0.0	0.0			
	41 -	RADMTX	3	0.0	0.0	0.0	0.0				
	42-	RADMIX	4	0.0	0.0	0.0					
	43-	RADMTX	5	0.0	0.0						
	44-	RADMTX	6	0.0	•						
	45-	SLOAD	300	1	4.	2	8.				
	46-	SLOAD	300	3	8.	4	4.				
	47-	SLOAD	300	5	4.	6	8.				
	48-	SLOAD	300	7	8.	8	4.				
	49-	SPC1	100	1	100						+TM3
	50-	TABLEM1			300	1 25	ENDT				7 I M 3
	51-	+TM3	200.	1.	300.	1.25	ENDT				

100 mm

7

SORTED BULK DATA ECHO

CARD 1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 . COUNT +TM4 TABLEM1 6000 52-+TM4 200. 300. Ο. ENDT 53 -Ο. 54-TEMP 400 100 30C. TEMPD 400 300. 55-ENDDATA

NO ERRORS FOUND - EXECUTE NASTRAN PROGRAM

*** USER INFORMATION MESSAGE FULL INTERNAL SPACE NODE AVAILABLE

*** USER INFORMATION MESSAGE 6 ELEMENTS HAVE A TOTAL VIEW FACTOR (FA/A) LESS THAN 0.99

*** USER INFORMATION MESSAGE 3023, B = 3
C = 0
R = 2

*** USER INFORMATION MESSAGE 3027, SYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

*** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKFF HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 1

*** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKSF HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2

*** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKFS HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2

*** SYSTEM WARNING MESSAGE 2189, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKSS HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 1

*** SYSTEM WARNING MESSAGE 2169. THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HRFN HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2

*** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MCDULE FOR SUB-PARTITION HRSN HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2

*** USER INFORMATION MESSAGE 3028. B = 4 BBAR = 5 C = 3 CBAR = 0 R = 7

*** USER INFORMATION MESSAGE 3027, UNSYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

DIAG 18 OUTPUT FROM SSGHT

ITERATION	EPSILON-P	LAMBDA-1	EPSILON-T	
####=======				
1	7.890577E-02			
2	5.655199E-CC	1.539461E 01	5.038404E-04	
3	9.080866E-04	6.397274E 00	2.097920E-04	
4	1.516862E-04	6.027384E 00	3.735893E-05	

*** USER INFORMATION MISSAGE 3086, ENTERING SSGHT EXIT MODE BY REASON NUMBER 1 (NORMAL CONVERGENCE)

NON-LINEAR STEADY-STATE PROBLEM ... K = F(T) AND K = ANISOTROPIC

JANUARY 1, 1976 NASTRAN 12/31/74 PAGE

GΕ

TEMPERATURE VECTOR

POINT ID.	TYPE		ID+1 VALUE	ID+2 VALUE	ID+3 VALUE	ID+4 VALUE	ID+5 VALUE
	3	2.7351786 02	2.5163/56 02	2.232829E U2	2.144910E 02	2.7351786 02	2.516375E 02
7	S	2.232829E 02	2.144910E 02	2.735178E 02	2.735178E 02		
100	S	3.000000E 02					

NON-LINEAR STEADY-STATE PROBLEM ... K = F(T) AND JANUARY 1, 1976 NASTRAN 12/31/74 PAGE K = ANISOTROPIC

LOAD VECTOR

POINT ID.	TYPE.	ID VALUE	ID+1 VALUE	ID+2 VALUE	ID+3 VALUE	ID+4 VALUE	ID+5 VALUE
1	S	4.000000E 00	8.000000E 00	8.000000E 00	4.000000E-00	4.000000E 00	8.000000E 00
7	S	8.000000£ 00	4.000000E 00				

NON-LINEAR STEADY-STATE PROBLEM ... K = F(T) AND K = ANISOTROPIC

JANUARY 1, 1976 NASTRAN 12/31/74

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PAGE

FORCES OF SINGLE-POINT CONSTRAINT

POINT ID. TYPE ID VALUE ID+1 VALUE ID+2 VALUE ID+3 VALUE ID+4 VALUE ID+5 VALUE 100 S 1.663081E 02

```
NASTRAN LOADED AT LOCATION CFAF20
TIME TO GO = 59 CPU SEC., 239 I/O SEC.
     U CPU-SEC.
                        O ELAPSED-SEC.
                                            SEMI
                                                  BEGN
     O CPU-SEC.
                        O ELAPSED-SEC.
                                            SEMT
     O CPU-SEC.
                        2 ELAPSED-SEC.
                                            NAST
     O CPU-SEC.
                        3 ELAPSED-SEC.
                                            GNFI
     O CPU·SEC.
                        3 ELAPSED-SEC.
                                            XCSA
     O CPU-SEC.
                        4 ELAPSED-SEC.
                                            IFP1
     O CPU-SEC.
                        7 ELAPSED-SEC.
                                            XSOR
     1 CPU-SEC.
                       12 ELAPSED-SEC.
                                              DΟ
                                                  IFP
     1 CPU-SEC.
                       23 ELAPSED-SEC.
                                             END
                                                  IFP
     1 CPU-SEC.
                       23 ELAFSED-SEC.
                                            XGPI
     2 CPU-SEC.
                       28 ELAPSED-SEC.
                                            SEM1
                                                  END
     2 CPU-SEC.
                       29 ELAPSED-SEC.
                                                  LINKNSO2 ---
    22 I/O SEC.
LAST LINK DID NOT USE
                             G BYTES OF OPEN CORE
     3 CPU-SEC.
                       31 ELAPSED-SEC.
                                                  LINX END ---
                                            ----
     3 CPU-SEC.
                       31 ELAPSED-SEC.
                                            XSFA
     3 CPU-SEC.
                       32 ELAPSED-SEC.
                                            XSFA
     3 CPU-SEC.
                       32 ELAPSED-SEC.
                                                  GP1
                                                           BEGN
     3 CPU-SEC.
                       US ELAPSED-SEC.
                                                  GP1
                                                           END
     3 CPU-SEC.
                       16 ELAPSED-SEC.
                                                  GP2
                                                           BEGN
     3 CPU-SEC.
                       07 ELAPSED-SEC.
                                                           END
                                                  GP2
                                            5
                       37 ELAFSED-SEC.
     3 CPU-SEC.
                                            7
                                                  PLTSET
                                                          BEGN
     3 CPU-SEC.
                       37 ELAPSED-SEC.
                                            7
                                                  PLTSET
                                                          END
     3 CPU-SEC.
                       38 ELAPSED-SEC.
                                                  PRIMSG
                                                          BEGN
     3 CPU-SEC.
                       38 ELAPSED-SEC.
                                                  PRIMISG
                                                          END
     3 CPU-SEC.
                       38 ELAPSED-SEC.
                                                          BEGN
                                            10
                                                  SETVAL
     3 CPU-SEC.
                                                  SETVAL
                                                          END
                       SB ELAPSED-SEC.
                                            10
     3 CPU-SEC.
                       39 ELAPSED-SEC.
                                            18
                                                  GP3
                                                           BEGN
     3 CPU-SEC.
                                                  GP3
                                                           END
                       44 ELAPSED-SEC.
                                            18
     3 CPU-SEC.
                       44 ELAPSED-SEC.
                                            20
                                                  TA1
                                                           BEGN
     3 CPU-SEC.
                       52 ELAPSED-SEC.
                                            20
                                                  TA1
                                                           END
                                                  LINKNSO3 ---
     3 CPU-SEC.
                       53 ELAPSED-SEC.
    52 1/0 SEC.
LAST LINK DID NOT USE
                       41828 BYTES OF OPEN CORE
     3 CPU-SEC.
                       56 ELAPSED-SEC.
                                                  LINK END ---
     3 CPU-SEC.
                       56 ELAPSED-SEC.
                                            24
                                                  SMA1
                                                           BEGN
     4 CPU-SEC.
                       59 ELAPSED-SEC.
                                            24
                                                  SMA1
                                                           END
                                                  LINKNSG5 ---
     4 CPU-SEC.
                       GO ELAPSED-SEC.
    57 1/0 SEC.
LAST LINK DID NOT USE
                       23308 BYTES OF OPEN CORE
     4 CPU-SEC.
                       13 ELAPSED-SEC.
                                                  LINK END ---
                                            ----
     4 CPU-SEC.
                       13 ELAPSED-SEC.
                                            27
                                                  RMG
     4 CPU-SEC.
                                                  MP
                       G5 ELAPSED-SEC.
                                            SDCO
     4 CPU-SEC.
                                                  MP
                       66 ELAPSED-SEC.
                                            SDÇO
     4 CPU-SEC.
                       67 ELAPSED-SEC.
                                            FBS
     4 CPU-SEC.
                       GB ELAPSED-SEC.
                                            FBS
     4 CPU-SEC.
                       69 ELAFSED-SEC.
                                                 D
                                            MPYA
                                                  METHOD 2 NT. NBR PASSES =
                                                                              1.EST. TIME =
                                                                                                   0.0
     4 CPU-SEC.
                       70 ELAPSED-SEC.
                                            MPYA
                                                  D
     4 CPU-SEC.
                       70 ELAPSED-SEC.
                                            TRAN POSE
     4 CPU-SEC.
                       71 ELAPSED-SEC.
                                            TRAL.
                                                  POSE
     4 CPU-SEC.
                       71 ELAPSED-SEC.
                                            MPYA
                                                  METHOD 2 NT.NBR PASSES = 1,EST, TIME =
                                                                                                   0.0
     4 CPU-SEC.
                       72 ELAPSED-SEC.
                                            MPYA D
```

```
4 CPU-SEC.
                    74 ELAPSED-SEC.
                                       27
                                             RMG
                                                     END
                                       ---- LINKNSO4 ---
                    75 ELAPSED-SEC.
    4 CPU-SEC.
   73 I/O SEC.
LAST LINK DID NOT USE 31560 BYTES OF OPEN CORE
                                       ---- LINK END ---
   4 CPU-SEC.
                    79 ELAPSED-SEC.
    4 CPU-SEC.
                    79 ELAPSED-SEC.
                                       32
                                             GP4
                                                     BEGN
                                             GP4
                                                     FND
    5 CPU-SEC.
                   85 ELAFSED-SEC.
                                       32
                                       38 GPSP
                                                     BEGN
    5 CPU-SEC.
                    £6 ELAFSED-SEC.
                                       38 GPSP
                                                     END
    5 CPU-SEC.
                    £6 ELAPSED-SEC.
    5 CPU-SEC.
                   £7 ELAPSED-SEC.
                                       ---- LINKNS14 ---
   85 I/O SEC.
LAST LINK DID NOT USE 76084 BYTES OF OPEN CORE
                                    ---- LINK END ---
    5 CPU-SEC.
                 91 ELAPSED-SEC.
                                       39 OFP BEGN
    5 CPU-SEC.
                    91 ELAPSED-SEC.
                                       39 OFP
                                                     END
    5 CPU-SEC.
                   91 ELAPSED-SEC.
                                       ---- LINKNSO4 ---
                   S2 ELAPSED-SEC.
    5 CPU-SEC.
   88 I/O SEC.
LAST LINK DID NOT USE 74704 BYTES OF OPEN CORE
                   Số ELAPSED-SEC.
                                       ---- LINK END ---
    5 CPU-SEC.
    5 CPU-SEC.
                                       42 MCE1
                    96 ELAPSED-SEC.
                                                     END
    5 OPU-SEC.
                   SS ELAPSED-SEC.
                                       42
                                             MCE1
    5 CPU-SEC.
                   99 ELAPSED-SEC.
                                       44
                                             MCE2
                                                     BEGN
                                       MPYA D
    5 CPU-SEC.
                   101 ELAPSED-SEC.
                                             METHOD 2 NT. NER PASSES & 1, EST. TIME =
                                                                                         0.0
                                       MPYA D
    5 CPU-SEC.
                   102 ELAPSED-SEC.
    5 CPU-SEC.
                   102 ELAPSED-SEC.
                                       MPYA D
                                             METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                       MPYA D
    5 CPU-SEC.
                    .04 ELAPSED-SEC.
                                       MPYA D
    6 CPU-SEC.
                   G4 ELAPSED-SEC.
                                                                                         0.0
                                             METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                       MPYA D
    6 CPU-SEC.
                   105 ELAPSED-SEC.
                   108 ELAPSED-SEC.
                                       MPYA D
    6 CPU-SEC.
                                             METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                         0.0
                                       MPYA D
    6 CPU-SEC.
                   109 ELAPSED-SEC.
    6 CPU-SEC.
                   109 ELAPSED-SEC.
                                       MPYA D
                                             METHOD 2 T ,NBR PASS_3 =
                                                                      1.EST. TIME =
                                                                                         0.0
                                        MPYA D
    6 CPU-SEC.
                   110 ELAPSED-SEC.
    6 CPU-SEC.
                   111 ELAPSED-SEC.
                                       MPYA D
                                             METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                       MPYA D
    6 CPU-SEC.
                   112 ELAPSED-SEC.
                                        44 MCE2
                                                     END
    7 CPU-SEC.
                   113 ELAPSED-SEC.
                                        ---- LINKNSO7 ---
                   114 ELAPSED-SEC.
    7 CPU-SEC.
  107 I/O SEC.
LAST LINK DID NOT USE 68372 BYTES OF OPEN CORE
    7 CPU-SEC.
                   119 ELAFSED-SEC.
                                       ---- LINK END ---
    7 CPU-SEC.
                   119 ELAPSED-SEC.
                                       50
                                             VEC
                                                     BEGN
                                       50 VEC
                                                     END
    7 CPU-SEC.
                   120 ELAPSED-SEC.
                                       51 PARTN BEGN
    7 CPU-SEC.
                   120 ELAPSED-SEC.
                                       51 PARTN
                                                   END
    7 CPU-SEC.
                   122 ELAPSED-SEC.
                   123 ELAPSED-SEC.
                                       XSFA
    7 CPU-SEC.
    7 CPU-SEC.
                   123 ELAPSED-SEC.
                                       XSFA
                                       52 PARTN
                                                     BEGN
    7 CPU-SEC.
                   123 ELAPSED-SEC.
                                       52 PARTN END
    7 CPU-SEC.
                   124 ELAPSED-SEC.
                                       55 DECOMP BEGN
    7 CPU-SEC.
                   125 ELAPSED-SEC.
    7 CPU-SEC.
                   125 ELAPSED-SEC.
                                       DECO MP
                   127 ELAPSED-SEC.
                                       DECO MP
    7 CPU-SEC.
                                        55
                                             DECOMP END
    7 CPU-SEC.
                   129 ELAPSED-SEC.
                                        ---- LINKNSC5 ---
                   130 ELAPSED-SEC.
    7 CPU-SEC.
 119 I/O SEC.
LAST LINK DID NOT USE 59592 BYTES OF OPEN CORE
                   131 ELAFSED-SEC.
                                       ---- LINK END ---
    7 CPU-SEC.
                                        59
                                             SSG1
                                                     BEGN
     7 CPU-SEC.
                   131 ELAPSED-SEC.
                                             SSG1
                                                     END
                   135 ELAPSED-SEC.
                                       59
    7 CPU-SEC.
```

BEGN

63 SSG2

136 ELAPSED-SEC.

7 CPU-SEC.

سن سنون

```
7 CPU-SEC.
                  137 ELAPSED-SEC.
                                             METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                         0.0
     7 CPU-SEC.
                  139 FLAPSED-SEC.
                                        MPYA D
     7 CPU-SEC.
                   141 FLAPSED-SEC.
                                        MPYA D
                                             METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                         0.0
                                        MPYA D
     8 CPU-SEC.
                    142 ELAPSED-SEC.
     8 CPU-SEC.
                   142 ELAPSED-SEC.
                                        63
                                             SSG2
                                                     END
                                             SSGHT
                                                    BEGN
     8 CPU-SEC.
                    142 ELAPSED-SEC.
                                        66
     S CPU-SEC.
                    15.7 FLAPSED-SEC.
                                        66
                                             SSGHT END
     8 CPU-SEC.
                    15.7 ELAPSED-SEC.
                                        ---- LINKNSO8 ---
   153 I/O SEC.
LAST LINK DID NOT USE 24432 BYTES OF OPEN CORE
                                       ---- LINK END ---
     8 CPU-SEC.
                    164 ELAPSED-SEC.
     8 CPU-SEC.
                    164 ELAPSED-SEC.
                                        71 PLTTRAN BEGN
     8 CPU-SEC.
                    165 ELAPSED-SEC.
                                        71 PLITRAN END
     8 CPU-SEC.
                    166 ELAPSED-SEC.
                                       ---- LINKNS13 ---
= 159 I/O SEC.
LAST LINK DID NOT USE 73552 BYTES OF OPEN CORE
                                     ---- LINK END ---
     B CPU-SEC.
                 171 ELAPSED-SEC.
     8 CPU-SEC.
                    171 ELAPSED-SEC.
                                        74 SDR2 BEGN
                                        74 SDR2
     8 CPU-SEC.
                    174 ELAPSED-SEC.
                                                     END
     B CPU-SEC.
                    175 ELAPSED-SEC.
                                      ---- LINKNS14 ---
= 168 I/O SEC.
LAST LINK DID NOT USE 25468 BYTES OF OPEN CORE
     8 CPU-SEC.
                    181 ELAPSED-SEC.
                                       ---- LINK END ---
     8 CPU-SEC.
                    181 ELAPSED-SEC.
                                        75 OFP
                                                     BEGN
     8 CPU-SEC.
                    183 ELAPSED-SEC.
                                        75 OFP
                                                     FND
                                       ---- LINKNS13----
     8 CPU-SEC.
                    183 ELAPSED-SEC.
= 176 I/O SEC.
LAST LINK DID NOT USE 68004 BYTES OF OPEN CORE
     9 CPU-SEC.
                                       ---- LINK END ---
                   :91 ELAPSED-SEC.
     9 CPU-SEC.
                                        77
                                             SDRHT BEGN
                    191 ELAPSED-SEC.
    9 CPU-SEC.
                                        77
                                              SDRHT END
                    191 ELAPSED-SEC.
                                      ---- LINKNS14 ---
     9 CPU-SEC.
                  191 ELAPSED-SEC.
  185 I/O SEC.
LAST LINK DID NOT USE 39888 BYTES OF OPEN CORE
     9 CPU-SEC.
                    202 ELAPSED-SEC.
                                     ---- LINK END ---
                                             OFP
     9 CPU-SEC.
                    202 ELAPSED-SEC.
                                        78
                                                     BEGN
     9 CPU-SEC.
                                        78
                                              OFP
                                                     END
                    202 ELAPSED-SEC.
     9 CPU-SEC.
                    203 ELAPSED-SEC.
                                        92
                                              EXIT
                                                     BEGN
= 183 I/O SEC.
LAST LINK DID NOT USE 74704 BYTES OF OPEN CORE
```

AMOUNT OF OPEN CORE NOT USED = OK BYTES

MANAGEMENT AND MANAGEMENT MANAGEMENT AND ADDRESS OF THE PARTY OF THE P WE MAKE WAS ASSESSED WAS A STREET OF THE STR Williament after transfer and a matter and a second at the control of the control N. W. MANDELL, A SHEAR WITH THE COMPLETE COMPANIES AND STREET SPEAKED. ватема и у плето утакоммате, правилите у получения праводовой указациями, под 1BM 360-370 SERIES MARTIN GUER A SIGNET SUBBING SUBMINES SUCCESSION DESCRIPTION CONFIDENCES MODELS 91,95 BRICK REPORTED. RESIMBLED AND DESCRIPTION AND ADDRESS OF A STREET AND ADDRESS OF THE PROPERTY MACHEMATINATIN SEA MIGUNE EMPENDER MULTIPASTAMEN BARRE BARRE BARRES BEREING BER BUCK MARKEN BER BEREINE BEREINE RIGID FORMAT SERIES M ACCOMPANY DESCRIPTION OF THE PROPERTY OF THE P RANKOSHAS TATAT KERJEAN - 6 LYMME DEN KIMMENMINIMANIMANIKAN - BENDEMBERGARANIAN GERGER GENERALI (M. 1777/7/ MARKET THE PROPERTY OF THE PRO LEVEL 15.5.3 ASSOCIATION ASSOCIATION OF THE CONTROL OF THE CONTR MEGACULANDER CONTROL RECONSTRUCTION CONTROL CO мммания вызраммення выменя политической выправления вы MACONDISTRIBUTION ATMINISTRATION OF THE PROPERTY OF THE PROPER MANAGEMENT MINIMANAGEMENT /MM --ASSESSMENT AND ASSESSMENT MARKEMAN 1660 MMSSMM MOSCOWOOM MANAGAM MMMMMM/// /// M MM - - NMM MMMM MINIMANIAMANA. MARKA MMM MMM MOPONIA Μ MARKE M TEMPAT M BARAGARA 1/1///// MINISTER - - MINISTER MMMMA SMMMMAGAMMMG. MEDITED SALM MM 1.1 0.00.00.1 MMWW// /// MMM MW NIMM /////www MANAGEMENT - MANAGEMENT MEMBARAMA MM MARKET CATALOGIC A.M MIME OFFICE M 1:11 111 Missing NAMES AND ADDRESS OF A STATE OF A 2.1 MAAM ---M MUNGAGIAMM MM MMMM 14:4 MATERIA TO METERIA MINNEA METPALBAMIC M / /// ///MM MGG SSSMMSSMMMS - - - M MM MIXIM MM MYAWM MAD WAS MUMM MERCENIM MM MOREGIMEN NINCOMMEN 11111 1/ 10 MASSAM MMODEL - - MOMM MW MMMMMM MM/////// MIMMANIA мизамамм M MILIM MANAGAGA 11 1 MMMMMMM MIGHT MANAMAMAMAMAM MANN - - - - MANNA MM ////AMANASAMA M. Missiona MAMMAM ATTACK MISSING MANAGEMENT AND THE COMMENTS AND THE COME N1 MISMMU MMM MM ---M MARKIM MiA MIANIM MG MANG MMMM MMMMMM MMMM MINIMETER STATEMENT I BUBLISH PARAMETER MM - - - - MARKADAN BURINGSANAS ANDRES ANDRES AND TO RECOMMENDE MM MMM ENTER CONTROL OF THE SECOND OF MANAGEMENTAL - - MANAGEMENTAL MANAGEMENTAL - - MANAGEMENTAL MICHAGO GEORGIAMMICADAN/MANGANIA MICHAGO ESTAMARIAM MANAGAMAGAN - 1 - MIAGRAPINAMAMAGAMAGAMAMAM мателициямимимический маленовичной MANYSTATERIAM MESSELVAN - - VERMANARARIMINAM SANCTIMENTAL AND SANCTIMENTAL AND CONTRACTORS AND ANGIOMINISTRATIVATIVA MENNAGALINERA ANGIOTIALA GARANTERIA SIGUENTIA GERMANISTRATIVA - - - LANGIOMERIA COLADARINA MISSINGS DEBINARIES - DELI VERMANDANIAN MANAGEMENTANIAN MISSINGS AND MISSINGS STATES Миментемми - - польколомому поменти по SYSTEM GENERATION DATE - 12/31/74 ABBORNMER - - POP PSB 17 CONSCINABIONARIO DE DE CARROL AND LIGITATION DE L'ARREST DE L'ARR AMAY SEA ABORD ISSUMDE - Мамириментул полимающим такжений и полимающим полимаю вильновые пописывание в поставление в постав мильт удолгоговы под применений п

NASTRAN EXECUTIVE CONTROL DECK ECHO

```
$ START OF EXECUTIVE CONTROL *******************************
ID CLASS PROBLEM NINE, C.E. JACKSON
$
$ MAXIMUM CPU TIME ALLOWED FOR THE JOB
$
TIME 10
5
$ THE THERMAL ANALYZER PORTION OF NASTRAN IS TO BE USED
APP HEAT
S THE NON-LINEAR TRANSIENT SOLUTION ALGORITHM IS TO BE USED
50L 9
$
$ REQUEST FOR DIAGROSTIC WHICH PRINTS OUT CONVERGENCE .. CRITERIA
$ PRODUCES OUTPUT ONLY FOR SOL 3
DIAG 18
$ A CHKPNT TAPE IS TO BE MADE TO ALLOW FOR LATER RESTAR; S
CHKPNT YES
CEND
```

JANUARY 1, 1976 NASTRAN 12/31/74 PAGE 2

NASTRAN EXECUTIVE CONTROL DECK ECHO

ECHO OF FIRST CARD IN CHECKPOINT DICTIONARY TO BE PUNCHED OUT FOR THIS PROBLEM
RESTART CLASS , PPOBLEM . 1/ 1/76, 27120.

CASE CONTROL DECK ECHO

```
CARD
COUNT
1
 2
       $ END OF EXECUTIVE CONTROL --- START CASE CONTROL ***********************
 3
                NON-LINEAR TRANSIENT PROBLEM ... A RESTART TAPE WILL BE MADE
 6
       TITLE=
8
       $ SPECIFY 51 LINES OF DATA PER PAGE (DOES NOT INCLUDE HEADINGS AT TOP OF PAGE)
9
10
       LINE=51
11
       $ REQUEST SORTED AND UNSORTED OUTPUT
12
13
       $ IF THIS CARD IS OMITTED, ONLY THE SORTED BULK DATA WILL APPEAR
14
15
       ECHO=BOTH
16
17
       $ SELECT THE MPC AND LOAD SETS TO BE USED IN THIS SOLUTION
       S NOTE THAT NO SPC SET IS SELECTED. AND THAT DLOAD HAS REPLACED LOAD.
18
19
20
       MPC=200
21
       DLOAD=300
22
23
       $ SELECT THE TEMPERATURE SET WHICH IS AN ESTIMATE OF THE FINAL SOLUTION VECTOR
24
       $ THE SELECTION OF THIS SET IS OPTIONAL FOR SOL 9. BUT SHOULD BE MADE IF
25
       $ THE FINAL TEMPERATURE IS SEVERAL HUNDRED DEGREES DIFFERENT FROM THE
26
       $ IC VECTOR, AND RADIATIVE INTERCHANGES ARE INCLUDED.
27
28
       TEMP(MATERIAL)=400
29
30
       5 SELECT THE STEP SIZE, NUMBER OF INCREMENTS, AND PRINTOUT FREQUENCY
31
       $
32
       TSTEP=500
33
34
       $ SELECT THE TEMPERATURE SET DEFINING THE TEMPERATURE VECTOR AT T=0.
35
36
       IC=600
37
38
       & SELECT OUTPUT DESIRED
39
40
       OUTPUT
41
42
       $ DEFINE A GROUP OF GRID POINTS TO BE REFERENCED BY AN OUTPUT REQUEST
43
44
       SET 5 = 1, 2, 3, 4, 5, 6, 7, 8, 100
45
46
       S REFERENCE A PREVIOUSLY DEFINED GROUP OF GRID POINTS
47
48
       THERMAL=5
49
50
       51
```

NON-LINEAR TRANSIENT PROBLEM ... A RESTART TAPE WILL BE MADE JANUARY 1, 1976 NASTRAN 12/31/74 PAGE 4

CASE CONTROL DECK ECHO

PAGE

INPUT BULK DATA DECK ECHO

```
4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10
    1 .. 2 .. 3 ..
£
$ UNITS MUST BE CONSISTENT
S IN THIS PROBLEM, METERS. WATTS, AND DEGREES CELSIUS ARE USED
$
$
S DEFINE GRID POINTS
$
GRID
                        . 1
                                0.
                                         Ο.
GRID
GRID
        3
                         . 2
                                Ο.
                                         Ο.
GRID
                         . з
                                Ο.
                                         Ο.
GRID
                        ο.
GRID
        6
                         . 1
                                 . 1
                                         Ο.
GRID
                         . 2
                                         Ο.
                                 . 1
GRID
        8
                         . 3
                                         G.
                                 . 1
GRID
        9
                        Ο.
                                 . 2
GRID
                         Ο.
                                - . 1
        10
GRID
                         -.05
                                 .05
        100
$
S CONNECT GRID POINTS
$
                                2
CROD
        10
                100
                         10
CROD
        20
                100
                         9
                                 6
                                         6
                                                 5
CQUAD2
        30
                200
                        1
                                 2
CQUAD2 40
                200
                         2
                                 3
                                         7
                                                 6
CQUAD2 50
                200
                         3
                                 4
S DEFINE CROSS-SECTIONAL AREAS AND/OR THICKNESSES
$
                         .001
PROD
        100
                 1000
PQUAD2 200
                 1000
                         . 01
S DEFINE MATERIAL THERMAL CONDUCTIVITY AND THERMAL MASS
$
                                                                          ALUMINUM
MAT4
        1000
                 200.
                         2.426+6
S
$ DEFINE CONVECTIVE AREA AND CONVECTIVE COEFFICIENT 'H'
$
CHBDY
                 300
                         LINE
                                         5
                                                                          +CONVEC
        60
+CONVEC 100
                 100
                 3000
                         .314
PHBDY
        300
MAT4
         3000
                 200.
S
S DEFINE CONSTRAINTS
$
MPC
                                                          -1.
         200
                 9
                                 1.
                                                          -1.
MPC
         200
                 10
S DEFINE APPLIED LOADS
$
SLOAD
        300
                         4.
                                         8.
                1
```

PAGE

INPUT BULK DATA DECK ECHO

```
4 ..
                  3 ..
                                 5 .. 6 .. 7 .. 8 ., 9 .. 10 .
SLOAD 300
              3
                      8.
                             4
                                     4.
SLOAD 300
              5
                      4.
                             6
                                     8.
SLOAD 300
                      8.
                              8
                                     4.
              7
$ THE FOLLOWING BULK DATA CARDS WERE ADDED TO CONVERT PROBLEM ONE TO
S PROBLEM TWO. THE ONLY BULK DATA CARD REMOVED FROM THE PREVIOUS SOLUTION WAS
$ THE SPC CARD
$ THIS SPC1 CARD REPLACES THE SPC CARD REMOVED FROM ABOVE
SPC1 100
              1
                      100
$
$ RADIATION BOUNDARY ELEMENTS
CHBDY
       200
               2000
                      APEA4
CHBDY
       300
               2000
                      APEA4
                                                    6
YCHO
       400
               2000
                      AREA4 3
                                             8
                                                    7
                      AREA4 5
                                     6
CHEDY
       500
               2000
                                             2
                                                    1
                                                    2
               2000
                      AREA4 6
                                     7
                                             3
CHBDY
       600
                                                     3
CHBDY 700
               2000
                      AREA4 7
$ EMISSIVITY OF RADIATING ELEMENT
                              .90
PHBDY 2000
S ESTIMATE OF FINAL STEADY STATE SOLUTION VECTOR --- REFERENCED
$ BY TEMP(MATERIAL) IN CASE CONTROL
$
TEMP
       400
               100
                      300.
TEMPD 400
               300.
$ PARAMETERS CONTROLLING RADIATION LOADING AND THE ITERATION LOOPING
PARAM TABS
               273.15
PARAM SIGMA 5.685E-8
PARAM MAXIT 8
PARAM EPSHT .0001
S DEFINITION OF THE RADIATION MATRIX
$ ALL OF THE RADIATION GOES TO SPACE
                                             700
RADLST 200
                      400
                              500
                                     600
               300
                                                     ο.
                                     Ο.
                                             0.
RADMTX 1
               0.
                      Ο.
                              Ο.
RADMIX 2
                                             Ο.
                      Ο.
                              0.
                                     0.
               Ο.
RADMIX 3
               Ο.
                      ο.
                              0.
                                     ο.
RADMIX 4
               ٥.
                      О.
                              Ο.
RADMTX 5
               Ο.
                      Ο.
RADMTX 6
               Ο.
```

INPUT BULK DATA DECK ECHO 1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 . S THE FOLLOWING BULK DATA CARDS WERE ADDED FOR THE TRANSIENT SOLUTION --------S THEY CONVERT PROBLEM TWO TO PROBLEM THREE \$ NOTE THAT THE SPC1 SET WAS NOT SELECTED IN CASE CONTROL S NOTE THAT SPCF OUTPUT IS NOT REQUESTED IN TRANSIENT \$ NOTE THAT THERMAL MASS WAS ADDED TO 'MAT4' CARD 1000 \$ NOTE THAT THE DIAG CARD IN THE EXECUTI'T. CONTROL WAS IRRELEVANT \$ NOTE THAT THE LCAD REQUEST IN CASE CONTROL IS NOW A DLOAD REQUEST c \$ TRAUSIENT SINGLE POINT CONSTRAINT METHOD S CONSTRAIN GRID POINT 100 TO 300 DEGREES CELSIUS CELAS2 300 1.+5 100 1 SLOAD 300 100 300.+5 S DEFINES A CONSTANT LOAD SET APPLIED FROM T=0. TO T=1.+6 SECONDS TLOAD2 300 300 1.+6 0. +TL1 Ο. +TL1 0. n. S DEFINES THE NUMBER OF INCREMENTS, THE STEP SIZE, AND THE PRINTOUT FREQUENCY 3 REFERENCED IN CASE CONTROL AS 'ISTEP' \$ EACH TIME STEP IS 30 SECONDS ISTER 500 45 30. 1 \$ S DEFINES A TEMPERATURE VECTOR --- REFERENCED IN CASE CONTROL AS '1C' TEMPD 600 300. S·イマスのイグスペングインをデングラングできるからかけるがあるからなるというからなかないかがあるからないからないないがないないないがない。 \$ PROBLEM NINE DEMONSTRATES THE GENERATION OF A RESTART TAPE. S NO NEW BULK DATA CARDS WERE REQUIRED TO CONVERT PROBLEM THREE TO 5 PROBLEM NINE. THE ONLY CHANGES MADE WERE TO ACTIVATE UNITS S FTO7FCO1 AND NPTP VIA THE JOB CONTROL LANGUAGE. AND TO ADD THE S 'CHAPNT YES' CARD TO THE EXECUTIVE CONTROL. \$ TO REDUCE THE OUTPUT VOLUME. THE ONLY OUTPUT REQUESTED IN THIS \$ RUN IS THERMAL=5 5-------\$ ENDDATA

*** USER INFORMATION MESSAGE 207, BULK DATA NOT SORTED, XSORT WILL RE-ORDER DECK.

"OTAL COUNT= 146

			S 0	RTE	D 9	UL	. к	D A	ΔТ	Δ		Ε (Эн	0					
CARD																			
COUNT	1	2	3	4		5		6			7			8	 9		10		
1 -	CELAS2	300	1.+5	100	1														
2-	CHBDY	60	300	LINE	1		5									+C	ONVE	C	
3-	+CONVEC	100	100																
4 -	CHBDY	200	2000	AREA4	1		2		6				5						
5-	CHBCY	300	2000	APEA4	2		3		7				3						
6-	CHSDY	400	2000	APEA4	3		4		8				7						
7-	CHBDY	500	2000	AREA4	5		6		2			•	1						
3-	CHBDY	600	2000	APEA4	6		7		3			2	2						
9-	CHBDY	700	2000	AREA4	7		8		4			;	3						
10-	CQUAD2	30	200	1	2		6		5										
11-	CQUAD2	40	200	2	3		7		6										
12-	CQUAD2	50	200	3	4		8		7										
13-	CROD	10	100	10	2														
14-	CROD	20	100	9	6														
15-	GRID	1		0.0	0.0		0.0												
16-	GRID	2		. 1	0.0		0.0												
17-	GRID	3		. 2	0.0		0.0												
18-	GRID	4		. 3	0.0	,	0.0												
19-	GRID	5 6		0.0 .1	.1		0.0												
20-	GRID	7			- 1		0.0												
21 - 22 -	GRID GRID	8		. 2 . 3	. 1		0.0												
23-	GRID	9		0.0	. 2		0.0												
24-	GRID	10		0.0	1		0.0												
25-	GRID	100		05	. 05		0.0												
26-	MAT4	1000	200.	2.426+		'	0.0	,								ΔΙ	UMIN	UM	
27-	MAT4	3000	200.	220	•													••••	
28-	MPC	200	9	1	1.		5		1				-1.						
29-	MPC	200	10	1	1.		1		1				-1.						
30-	FARAM	EPSHT	.0001																
31 -	PARAM	MAXIT	8																
32-	PARAM	SIGMA	5.685E-	8															
33 -	PARAM	TABS	273.15																
34 -	PHEDY	300	3000	.314															
35-	PHBDY	2000			. 90)													
36 -	PQUAD2	200	1000	. 01															
37-	PROD	100	1000	. 001					_										
38-	RADLST	200	300	400	500		600			00									
39-	RADMTX	1	0.0	0.0	0.0		0.0			.0		(0.0						
40-	RADMIX	2	0.0	0.0	0.0		0.0		0	. 0									
41 -	RADMIX	3	0.0	0.0	0.0		0.0)											
42-	RADMIX	4	0.0	0.0	0.0)													
43-	RADMIX	5	0.0	0.0															
44 <i>-</i> 45-	RADMTX SLCAD	6 300	0.0	4.	2		8.												
46-	SLOAD	300	3	8.	2 4		4.												
47-	SLOAD	300	5	4.	6		я. Я.												
48-	SLOAD	300	7	8.	8		٠.,												
49-	SLOAD	300	100	300.+5	Ŭ														
50-	SPC1	100	1	100															
51 -	TEMP	400	100	300.															

			_	, , , ,				_		- 0	<i>(</i> 1)			
CARD														
COUNT	. 1	2	3	3	4	5	٠.	6		7	8	9	10	
52-	TEMPD	400	300.											
53-	TEMPD	600	300.											
54-	TLOAD2	300	300				0.0)	1.+	6 0.	0	0.0	+TL1	
\$5 <i>-</i>	+TL1	Ο.	Ο.											
56-	TSTEP	500	45	30.	1									
	ENDDATA	١												

NASTRAN SOURCE PROGRAM COMPILATION DMAP-DMAP INSTRUCT⁻CN NO.

- *** USER WARNING MESSAGE 54.
 PARAMETER NAMED EPSHT NOT REFERENCED
- *** USER WARNING MESSAGE 54.
 PARAMETER NAMED MA>IT NOT REFERENCED

NO ERRORS FOUND - EXECUTE NASTRAN PROGRAM

CONTINUATION OF CHECKPOINT DICTIONARY .

1,	XVPS		FLAG\$	=	Ο.	REEL	=	1,	FILE	=	5
2. 3.	REENTER HGPL	Α;;	DMAP SE			NUMBE REEL			FILE	=	6
4.	HEQEXIN	÷.	FLAGS			REEL	=	1.	FILE	=	7
5.	HGPDT		FLAGS			REEL			FILE	=	8
6,	HBGPDT		FLAGS	=	Ο.	REEL	=	1.	FILE	=	9
7.	HSIL		FLAGS	×	Ο.	REEL	Ξ	1,	FILE	2 :	10
8,	XVPS		FLAGS	=	Ο,	REEL	=	1.	FILE	=	11
9,	HCSTM	,	FLAGS	=	Ο.	REEL	=	0.	FILE	=	0
1C.	HUSET		FLAG5	=	Ο,	REEL	=	0.	FILE	=	0
11,	HGM		FLAGS	×	Ο.	REEL	=		FILE		0
12,	HGO		FLAGS	×	Ο,	REEL	=		FILE		0
13,	HKAA	,	FLAGS	=	Ο,	REEL	=		FILE		0
14.	HBAA		FLAGS	=	Ο.	REEL			FILE		D
15,	HPSO	,	FLAGS	=	Ο,	REEL	ā	Ο.	FILE	=	0
16,	HKFS		FLAGS			REEL	=	Ο,	FILE	=	0
17.	HOP	,	FLAGS	32	Ο.	REEL	=	Ο.	FILE	=	0
18,	HEST	,	FLAGS	H	Ο,	REEL	=	Ο,	FILE	=	0
19,	REENTER	Αï	DMAP S	EQI	JENCE	NUMBS	R	10			
20,	HECT	,	FLAGS	=	Ο.	REEL	=	1,	FILE	=	12
21,	XVPS		FLAGS	=	Ο,	REEL	=	1,	FILE	=	13

ADDITIONS TO CHECKPOINT DICTIONARY

```
22. REENTER AT DMAP SEQUENCE NUMBER
                          REEL = 1, FILE =
23.
    XVPS
          FLAGS = 0.
                                                14
    HPLTPAR .
               FLAGS = 0.
                          RFFI = 0. FILE =
                                                0
    HGPSETS . FLAGS = 0.
                           REEL = O. FILE =
                                                0
    HELSETS . FLAGS = 0.
                          REFL = 0. FILE =
                                                 ٥
    REENTER AT DMAP SEQUENCE NUMBER
27.
                                                15
28.
    HGPTT . FLAGS = 0.
                           REEL = 1. FILE =
           . FLAGS = 0
    HSLT
                           RFEL = 1. FILE =
                                                16
29.
           . FLAGS = O.
                                                17
30. XVPS
                          REEL = 1. FILE =
31.
    REENTER AT DMAP SEQUENCE NUMBER
32
    HEST
              FLAGS = 0.
                           REEL = 1. FILE =
                                                18
33,
    HECPT
               FLAGS = 0.
                          REEL = 1. FILE =
                                                19
34.
    HGPCT
           , FLAGS = 0.
                          REEL = 1, FILE =
                                                20
           , FLAGS = 0.
                          REEL = 1. FILE =
                                                21
35.
    XVPS
36. REENTER AT DMAP SEQUENCE NUMBER
    HKGGX , FLAGS = 0. REEL = 1. FILE =
                                                22
37.
                          REEL = 1. FILE =
                                                23
38.
    XVPS
               FLAGS = 0.
           , FLAGS = 0, REEL = 0, FILE =
39, HGPST
40. REENTER AT DMAP SEQUENCE NUMBER
                          REEL = 1. FILE =
                                                24
41. HBGG
               FLAGS = 0.
42.
                           REEL = 1. FILE =
                                                25
     XVPS
               FLAGS - 0.
                           REEL = 0.
                                      FILE =
                                                 Ω
43,
     HBNN
               FLAGS = 0
            . FLAGS = O.
                           REEL ≈ 0.
                                      FILE =
44.
     HBFF
```

- *** USER INFORMATION MESSAGE FULL INTERNAL SPACE NODE AVAILABLE
- . 6 ELEMENTS HAVE A TOTAL VIEW FACTOR (FA/A) LESS THAN 0.99 *** USER INFORMATION MESSAGE
- R = *** USER INFORMATION MESSAGE 3023. C = 0 R = 2
- O SECONDS. *** USER INFORMATION MESSAGE 3027. SYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS
 - REENTER AT DMAP SEQUENCE NUMBER FLAGS = 0, REEL = 1, FILE = 46, HRGG 27 47. HKGG . FLAGS = 0.REEL = 1. FILE = 48, HQGE FLAGS = 0. REEL = 1, FILE = XVPS FLAGS = 0. REEL = 1. FILE = 49. REEL = O. FILE = 0 50. HRNN FLAGS = 0. FLAGS = 0. FILE = 0 51, HRFF REEL = 0.REEL = 0. HRAA FLAGS = 0. FILE = 0 52. REEL = O. FILE = HRDD FLAGS = 053,

```
FLAGS = 0.
                               REEL = 1.
                                            FILE =
                                                        30
     HRG
                               REEL = 1.
                                            FILE =
                                                        31
56.
     HUSET
                  FLAGS = Q.
                                            FILE =
57,
     XVPS
                  FLAGS = 0.
                               REEL = 1.
                                                        32
58.
     HGMD
                  FLAGS = 0.
                               REEL = 0,
                                            FILE =
                                                        0
     HGOD
                  FLAGS = 0.
                               REEL = 0.
                                            FILE =
                                                        ٥
59,
                  FLAGS = 0.
                               REEL = O.
                                            FILE =
                                                        0
60,
     HKNN
      REENTER AT DMAP SEQUENCE NUMBER
61.
                               REEL = 1, FILE =
                                                        33
62.
      HGM
                 FLAGS = 0.
63,
      XVPS
                  FLAGS = 0.
                               REEL = 1. FILE =
                                                        34
64,
      REENTER AT DMAP SEQUENCE NUMBER
65,
                  FLAGS = 0.
                               REEL = 1. FILE =
                                                        35
      HKNN
                               REEL = 1. FILE =
                                                        36
66,
      HRNN
                  FLAGS = 0.
                                                        37
67.
      HBNN
                  FLAGS = 0.
                               REEL = 1. FILE =
68.
      XVPS
                  FLAGS = 0.
                               REEL = 1. FILE =
                                                        38
      REENTER AT DMAP SEQUENCE NUMBER
69.
                               REEL = 1. FILE =
                                                        35
                  FLACS a 4.
70,
      HKNN
                               REEL = 1, FILE =
                                                        35
71.
      HKFF
                  FLAGS = 4.
      HRNN
                                REEL = 1.
                                             FILE =
                                                        36
72,
                  FLAGS 🖶 4.
                                                        36
73.
      HRFF
                  FLAGS # 4.
                                REEL = 1.
                                             FILE =
74.
      HBNN
                  FLAGS = 4.
                                REEL = 1.
                                             FILE =
                                                        37
                               REEL = 1.
75,
      HBFF
                  FLAGS a 4.
                                             FILE =
                                                        37
76.
      XVPS
                  FLAGS = 0.
                                REEL = 1.
                                             FILE =
                                                        39
      REENTER AT DMAP SEQUENCE NUMBER
77,
                  FLAGS a 4.
                                REEL = 1, FILE =
                                                        35
78,
      HKAA
                  FLACS = 4.
                                REEL = 1.
                                             FILE =
                                                        36
79.
      HRAA
                                                        37
                                             FILE =
80,
      HEAA
                  FLAGS = 4.
                                RE\hat{E}L = 1,
81.
      XVPS
                  FLAGS = 0,
                                REEL = 1.
                                             FILE =
                                                        40
82.
      REENTER AT DMAP SEQUENCE NUMBER
83.
      HUSETD
                  FLAGS - 0.
                                REEL = 1.
                                             FILE =
84,
      HEQDYN
                  FLAGS = 0.
                                REEL = 1.
                                             FILE =
                                                        42
                                REEL ≈ 1.
                                             FILE =
                                                        43
85.
      HOLT
                  FLAGS = 0.
                                             FILE =
                                                        44
                                REEL 📥 1.
86,
      HTRL
                  FLAGS = 0.
                                                        33
87,
      HGM
                  FLAGS = 4.
                                REEL = 1.
                                             FILE =
                  FLAGS = 4.
                                REEL = 1.
                                             FILE =
                                                        33
88,
      HGMD
                                             FILE =
89.
      HSILD
                  FLAGS a 0.
                                REEL = 1,
                                                        45
                  FLAGS = 0.
                                REEL 🗖 1.
                                             FILE =
                                                        46
90,
      HGPLD
                                             FILE =
                                                        47
91.
      XVPS
                   FLAGS = 0.
                                REEL = 1.
92,
      HTFPOOL .
                   FLAGS = 0.
                                REEL = 0.
                                             FILE =
                                                         0
93.
      HNLFT
                  FLAGS - 0.
                                REEL = 0.
                                             FILE =
                                                         0
94.
      HPP0
                   FLAGS = 0.
                                REEL = 0.
                                             FILE =
                                                         0
                                REEL = 0.
                                             FILE =
                                                         0
95,
      HPD0
                   FLAGS = 0.
                                             FILE =
96.
      HPDT
                  FLAGS = 0.
                                REEL = 0.
                                                         O
       REENTER AT DMAP SEQUENCE NUMBER
97.
                                             FILE =
98.
      HKDD
                   FLAGS = 4.
                                REEL ≈ 1.
                                             FILE =
                                                        36
99.
      HRDD
                   FLAGS = 4.
                                REEL = 1.
100.
      XVPS
                   FLAGS = 0.
                                REEL n 1.
                                             FILE =
                                                        48
101,
      HK2PP
                  FLACS = 0.
                                REEL = O.
                                             FILE =
                                                         ۵
102.
      HB2PP
                  FLAGS = 0.
                                REEL = 0.
                                             FILE =
                                                         0
                                             FILE =
                                                         ٥
103,
      HK2DD
                   FLAGS = 0.
                                REEL = 0.
                                             FILE =
104.
      HB2DD
                   FLAGS = 0.
                                REEL = 0,
```

ADDITIONS TO CHECKPOINT DICTIONARY

```
105. REENTER: AT DMAP SEQUENCE NUMBER 92
    106.
          HBDD
                . FLAGS = O. REFL ± 1. FILE =
    107.
          XVPS
                , FLAGS = 0. REEL = 1. FILE =
                                                    50
    108. REENTER AT DMAP SHOULDE NUMBER 97
    109. HPPO
                FLAGS = O. REEL = 1. FILE =
    110
          HPDO
                 , FLAGS = 4.
                               REFL = 1. FILE =
                 . FLACS = 4.
                               REEL = 1. FILE =
    111.
          HPDT
                                                    52
    112.
                , FLAGS - O.
         HTOL
                               REFL ≈ 1. FILE ≈
                                                    53
    113. XVPS
                , FLAGS ≈ O.
                               REEL = 1. FILE ■
                                R =
                                           SBAR =
*** USER INFORMATION MESSAGE 3028
                                           CBAR = 1
                                C =
                                      3
                                R =
                                      8
*** USER INFORMATION MESSAGE 3027, UNSYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS
                                                                             O SECONDS.
    114.
          REENTER AT DMAP SEQUENCE NUMBER
    115.
         HUDVT , FLAGS ■ O, REEL = 1, FILE =
                                                    55
    116, HPNLD , FLAGS = 0. REEL = 1. FILE =
    117, XVPS , FLAGS = 0, REEL = 1, FILE =
                                                    57
    118.
          REENTER AT DMAP SEQUENCE NUMBER 102
          XVPS , FLAGS = 0, REEL = 1, FILE =
    119.
                                                    58
    120, HOUDV1 , FLAGS = 0, REEL = 0, FILE =
                                                    Ω
    121.
          HOPNL1 . FLAGS = O. REEL = O. FILE =
                                                    Ω
     122.
          REENTER AT DMAP SEQUENCE NUMBER 118
    123, HUPV , FLAGS = 0, REEL = 1, FILE =
                                                    59
    124. XVPS . FLAGS = O. REEL ■ 1. FILE =
                                                    60
    125. REENTER AT DMAP SEQUENCE NUMBER 123
```

FILE =

Ω

0

HOUPV2 . FLAGS = 0. REEL = 1. FILE =

, FLAGS = 0. REEL = 1.

HOPP2 , FLAGS = 0, REEL = 0, FILE =

HOOP2 , FLAGS = 0, REEL = 0, FILE =

130, HOES2 . FLAGS = 0. REEL ■ 0. FILE =

131. HOEF2 . FLAGS = 0. REEL = 0. FILE =

126, 127,

128.

129.

XVPS

TIME	TYPE	VALUE
0.0 3.000000E 01	s s	3.000000E 02 2.984949E 02
3.000000E 01 6.000000E 01	S	2.984949£ 02 2.959980E C2
9.000000E 01	S	2.938445E 02
1.200000E 02 1.500000E 02	S	2.919236E 02 2.901902E 02
1.800000E 02	s s	2.886216E 02
2.100000E 02 2.400000E 02	S	2.872031E 02 2.859224E 02
2.400000E 02 2.700000E 02	s s s s	2.859224E 02 2.847678E 02
3.0000C0E 02		2.837285E 02
3.300000E 02 3.600000E 02	S S	2.827942E 02 2.619548E 02
3.900000E 02	S	2.812014E 02
4.200000E 02 4.500000E 02	S S	2.805254E 02 2.799189E 02
4.80000CE 02	S	2.793750E 02
5.100000E 02 5.400000E 02	5555	2.788872E 02 2.784500E 02
5.700000E 02	S	2.780579E 02
6.000000E 02 6.300000E 02	S	2.777063E 02 2.773909E 02
6.300000E 02 6.600000E 02	S	2.773909E 02 2.771079E 02
6.900000E 02	S	2.768542E 02
7.200000E 02 7.500000E 02	s s	2.766267E 02 2.764224E 02
7.800000E 02	S S	2.762390E 02
8.1000C0E 02 8.400000E 02	S	2.760745E 02 2.759270E 02
8.700000E 02	S	2.757944E 02
9.000000E 02 9.300000E 02	S S	2.756755E 02 2.755686E 02
9.600000E 02		2.754727E 02
9.900000E 02 1.020000E 03	s s	2.753865E 02 2.753091E 02
1.05000GE 03	S	2.752395E 02
1.080000E 03 1.110000E 03	s s	2.751772E 02 2.751211E 02
1.140000E 03	S	2.7507088 02
1.170000E 03 1.200000E 03	S S	2.750254E 02 2.749849E 02
1.200000E 03 1.20000E 03	S	2,749849E 02 2,749482E 02
1.260000E 03	S	2.749153E 02 2.748860E 02
1.290000E 03 1.320000E 03	s s	2.748860E 02 2.748596E 02
1.350000E 03	S	2.748357E 02

TIME	TYPE	VALUE	
0.0	S	3.000000E	02
3.000000E 01	Š	2.973813E	02
6.000000E 01	S	2.927502E	02
9.000000E 01	S	2.884094E	02
1.200000E 02	S	2.844219E	02
	3		
1.500000E 02	S	2.807952E	02
1.800000E 02	S	2.775146E	02
2.100000E 02	S	2.745569E	02
2.400000E 02	Š	2.718955E	02
	3		
2.700000E 02	S	2.695042E	02
3.000000E 02	S	2.673574E	02
3.300000E 02	S	2.654314E	02
3.600000E 02	S	2.637039E	02
	Š		
3.900000E 02	S	2.621553E	02
4.200000E 02	S	2.607668E	02
4.500000E C2	S	2.595225E	02
4.800000 02	S	2.584070E	02
5.100000E 02	S	2.574070E	02
5.400000E 02	S	2.565105E	02
5.700000E 02	S	2.557069E	02
6.000000E 02	S	2.549862E	02
6.300000E 02	S	2.543399E	02
6.600000E 02	Š	2.537601E	02
6.9000COE 02	S	2.532400E	02
7.200000E 02	S	2.527734E	02
7.500000E 02	S	2.523547E	02
7.800000E 02	. S	2:519789E	02
8.1000COE Q2	Š	2.515416E	02
8.400000E 02	S	2.513388E	02
8.7000005 02	S	2.510670E	02
9.000000E 02	S	2.508229E	02
9.300000E 02	S	2.506038E	02
9.600000E 02	Š	2.504069E	02
9.900000E 02	S	2.502302E	02
1.020000E 03	S	2.500714E	02
1.050000E 03	S	2.499288E	02
1.080000E 03	S	2.498007E	02
1.110000E 03	S	2.496857E	02
	3		
1.140000E C3	S	2.495822E	02
1.170000E 03	S	2.494894E	02
1.200000E 03	S	2.494059E	02
1.230000E 03	55555	2.493309E	02
1.260000E 03	Š	2.492635E	02
	3		_
1.290000E 03	5	2.492030E	02
1.320000E 03	Ş	2.491485E	02
1.350000E 03	S	2.490997E	02

0.0 S 3.000000E 02 3.000000E 01 S 2.942329E 02 9.000000E 01 S 2.767437E 02 1.200000E 02 S 2.698711E 02 1.500000E 02 S 2.698923E 02 1.500000E 02 S 2.586531E 02 2.400000E 02 S 2.540391E 02 2.400000E 02 S 2.499607E 02 2.760000E 02 S 2.499607E 02 3.000000E 02 S 2.49316 02 3.00000E 02 S 2.402768E 02 3.00000E 02 S 2.377296E 02 3.00000E 02 S 2.377296E 02 3.90000E 02 S 2.334258E 02 4.20000E 02 S 2.334258E 02 4.500000E 02 S 2.334258E 02 4.500000E 02 S 2.354565E 02 4.500000E 02 S 2.354565E 02 5.100000E 02 S 2.354565E 02 6.500000E 02 S 2.259850E 02 6.600000E 02 S 2.259850E 02 6.700000E 02 S 2.259850E 02 6.700000E 02 S 2.260584E 02 6.900000E 02 S 2.250109E 02 6.500000E 02 S 2.232284E 02 6.900000E 02 S 2.232284E 02 6.900000E 02 S 2.217928E 02 7.500000E 02 S 2.217928E 02 7.500000E 02 S 2.21832E 02 7.500000E 02 S 2.2193061E 02 8.400000E 02 S 2.2193061E 02 8.400000E 02 S 2.193061E 02 9.000000E 02 S 2.193061E 02
6.000000E 01 S 2.847380E 02 9.000000E 01 S 2.767437E 02 1.200000E 02 S 2.698711E 02 1.500000E 02 S 2.638923E 02 1.500000E 02 S 2.586531E 02 2.100000E 02 S 2.540391E 02 2.400000E 02 S 2.499607E 02 3.000000E 02 S 2.463457E 02 3.00000E 02 S 2.453456E 02 3.500000E 02 S 2.452768E 02 3.500000E 02 S 2.377296E 02 3.60000E 02 S 2.377296E 02 3.77296E 02 S 2.374258E 02 4.500000E 02 S 2.354565E 02 4.500000E 02 S 2.354565E 02 4.500000E 02 S 2.354565E 02 5.100000E 02 S 2.354565E 02 5.100000E 02 S 2.299850E 02 5.100000E 02 S 2.299850E 02 5.100000E 02 S 2.250109E 02 S 2.240714E 02 6.600000E 02 S 2.240714E 02 6.600000E 02 S 2.240714E 02 6.500000E 02 S 2.224718E 02 7.20000E 02 S 2.211832E 02 7.500000E 02 S 2.211832E 02 7.50000E 02 S 2.211832E 0
9.000000E 01 S 2.767437E 02 1.20000E 02 S 2.698711E 02 1.500000E 02 S 2.698711E 02 2.100000E 02 S 2.586531E 02 2.100000E 02 S 2.586531E 02 2.40000E 02 S 2.540391E 02 2.40000E 02 S 2.499607E 02 3.00000E 02 S 2.493457E 02 3.00000E 02 S 2.431346E 02 3.300000E 02 S 2.431346E 02 3.300000E 02 S 2.377296E 02 3.60000E 02 S 2.377296E 02 3.900000E 02 S 2.374258E 02 4.20000E 02 S 2.354565E 02 4.20000E 02 S 2.316098E 02 4.500000E 02 S 2.316098E 02 4.500000E 02 S 2.259850E 02 5.40000CE 02 S 2.259850E 02 5.700000E 02 S 2.250109E 02 5.40000CE 02 S 2.250109E 02 6.600000E 02 S 2.250109E 02 6.600000E 02 S 2.240714E 02 6.600000E 02 S 2.240714E 02 6.900000E 02 S 2.24718E 02 7.20000E 02 S 2.217938E 02 7.50000CE 02 S 2.217938E 02 7.50000CE 02 S 2.217938E 02 7.50000CE 02 S 2.21832E 02 8.100000E 02 S 2.201442E 02 8.40000CE 02 S 2.197027E 02 8.70000CE 02 S 2.193061E 02 8.70000CE 02 S 2.189498E 02
1.20000GE 02 S 2.698711E 02 1.50000GE 02 S 2.638923E 02 2.100000E 02 S 2.586531E 02 2.10000GE 02 S 2.540391E 02 2.40000E 02 S 2.499607E 02 2.7600GE 02 S 2.499607E 02 3.00000E 02 S 2.463457E 02 3.0000GE 02 S 2.402768E 02 3.6000GE 02 S 2.377296E 02 3.9000GE 02 S 2.377296E 02 4.2000GE 02 S 2.334258E 02 4.5000GE 02 S 2.334258E 02 4.5000GE 02 S 2.336098E 02 4.5000GE 02 S 2.354565E 02 4.5000GE 02 S 2.354565E 02 5.1000GE 02 S 2.354565E 02 5.1000GE 02 S 2.354565E 02 6.6000GE 02 S 2.259850E 02 5.7000GE 02 S 2.259850E 02 5.7000GE 02 S 2.250584E 02 6.900GGE 02 S 2.250109E 02 6.3000GE 02 S 2.250109E 02 6.3000GE 02 S 2.240714E 02 6.6000GE 02 S 2.232284E 02 6.900GGE 02 S 2.217928E 02 7.200GGE 02 S 2.217928E 02 7.500GGE 02 S 2.21832E 02
1.500000E 02 S 2.638923E 02 1.60000E 02 S 2.586531E 02 2.100000E 02 S 2.540391E 02 2.40000E 02 S 2.499607E 02 2.70000E 02 S 2.431346E 02 3.300000E 02 S 2.431346E 02 3.300000E 02 S 2.377296E 02 3.90000E 02 S 2.377296E 02 3.90000E 02 S 2.374258E 02 4.20000E 02 S 2.316098E 02 4.50000E 02 S 2.316098E 02 4.50000E 02 S 2.295850E 02 5.100000E 02 S 2.265531E 02 5.100000E 02 S 2.265584E 02 6.00000E 02 S 2.272267E 02 5.70000E 02 S 2.260584E 02 6.00000E 02 S 2.260784E 02 6.600000E 02 S 2.240714E 02 6.600000E 02 S 2.2240714E 02 6.90000E 02 S 2.217928E 02 7.50000E 02 S 2.21832E 02 8.100000E 02 S 2.21832E 02 7.50000E 02 S 2.21832E 02 7.50000E 02 S 2.217928E 02 7.50000E 02 S 2.217928E 02 7.50000E 02 S 2.21832E 02 7.50000E 02 S 2.21832E 02 7.50000E 02 S 2.217928E 02 8.100000E 02 S 2.21832E 02 7.50000E 02 S 2.21832E 02 8.10000E 02 S 2.21832E 02 8.10000E 02 S 2.21832E 02
1.600000E 02 S 2.586531E 02 2.100000E 02 S 2.540391E 02 2.400000E 02 S 2.499607E 02 2.700000E 02 S 2.453457E 02 3.300000E 02 S 2.451346E 02 3.300000E 02 S 2.377296E 02 3.900000E 02 S 2.377296E 02 4.200000E 02 S 2.354565E 02 4.200000E 02 S 2.316098E 02 4.500000E 02 S 2.316098E 02 4.500000E 02 S 2.316098E 02 5.100000E 02 S 2.299850E 02 5.100000E 02 S 2.269850E 02 5.100000E 02 S 2.269850E 02 5.400000E 02 S 2.260584E 02 6.000000E 02 S 2.250109E 02 6.300000E 02 S 2.250109E 02 6.300000E 02 S 2.240714E 02 6.600000E 02 S 2.244718E 02 7.200000E 02 S 2.211832E 02 7.50000E 02 S 2.211832E 02 7.50000E 02 S 2.211832E 02 7.50000E 02 S 2.211832E 02 7.500000E 02 S 2.211832E 02
2.4C0000E 02 S 2.499607E 02 2.7C000CE 02 S 2.463457E 02 3.0C0000E 02 S 2.463146E 02 3.3C0000E 02 S 2.452768E 02 3.6C000CE 02 S 2.377296E 02 3.9C000CE 02 S 2.354565E 02 4.20000CE 02 S 2.316098E 02 4.5C000CE 02 S 2.316098E 02 4.5C000CE 02 S 2.269850E 02 5.1C00CCE 02 S 2.269850E 02 5.1C00CCE 02 S 2.272267E 02 5.7C00CCE 02 S 2.272267E 02 5.7C00CCE 02 S 2.260584E 02 6.9C00CE 02 S 2.250109E 02 6.3C00CCE 02 S 2.250109E 02 6.3C00CCE 02 S 2.240714E 02 6.6C00CCE 02 S 2.224718E 02 7.2C0CCCE 02 S 2.217928E 02 7.5C00CCE 02 S 2.21832E 02
3.3C000CE 02 S 2.402768E 02 3.6000C0E 02 S 2.377296E 02 4.20000CE 02 S 2.354565E 02 4.5000CCE 02 S 2.316098E 02 4.5000CCE 02 S 2.269850E 02 5.1000CCE 02 S 2.269850E 02 5.1000CCE 02 S 2.265301E 02 5.7000CCE 02 S 2.260584E 02 6.0000CE 02 S 2.260584E 02 6.3C000CE 02 S 2.250109E 02 6.3C000CE 02 S 2.240714E 02 6.6000CCE 02 S 2.240714E 02 6.6000CCE 02 S 2.217928E 02 7.2000CE 02 S 2.21832E 02 7.5000CCE 02 S 2.21832E 02 7.5000CCE 02 S 2.21832E 02 8.1000CCE 02 S 2.201442E 02 8.4000CCE 02 S 2.1970CTE 02 8.7000CCE 02 S 2.1970CTE 02 8.7000CCE 02 S 2.193061E 02 9.000CCCE 02 S 2.189498E 02
3.3C000CE 02 S 2.402768E 02 3.6000C0E 02 S 2.377296E 02 4.20000CE 02 S 2.354565E 02 4.5000CCE 02 S 2.316098E 02 4.5000CCE 02 S 2.269850E 02 5.1000CCE 02 S 2.269850E 02 5.1000CCE 02 S 2.265301E 02 5.7000CCE 02 S 2.260584E 02 6.0000CE 02 S 2.260584E 02 6.3C000CE 02 S 2.250109E 02 6.3C000CE 02 S 2.240714E 02 6.6000CCE 02 S 2.240714E 02 6.6000CCE 02 S 2.217928E 02 7.2000CE 02 S 2.21832E 02 7.5000CCE 02 S 2.21832E 02 7.5000CCE 02 S 2.21832E 02 8.1000CCE 02 S 2.201442E 02 8.4000CCE 02 S 2.1970CTE 02 8.7000CCE 02 S 2.1970CTE 02 8.7000CCE 02 S 2.193061E 02 9.000CCCE 02 S 2.189498E 02
3.3C000CE 02 S 2.402768E 02 3.6000C0E 02 S 2.377296E 02 4.20000CE 02 S 2.354565E 02 4.5000CCE 02 S 2.316098E 02 4.5000CCE 02 S 2.269850E 02 5.1000CCE 02 S 2.269850E 02 5.1000CCE 02 S 2.265301E 02 5.7000CCE 02 S 2.260584E 02 6.0000CE 02 S 2.260584E 02 6.3C000CE 02 S 2.250109E 02 6.3C000CE 02 S 2.240714E 02 6.6000CCE 02 S 2.240714E 02 6.6000CCE 02 S 2.217928E 02 7.2000CE 02 S 2.21832E 02 7.5000CCE 02 S 2.21832E 02 7.5000CCE 02 S 2.21832E 02 8.1000CCE 02 S 2.201442E 02 8.4000CCE 02 S 2.1970CTE 02 8.7000CCE 02 S 2.1970CTE 02 8.7000CCE 02 S 2.193061E 02 9.000CCCE 02 S 2.189498E 02
3.600000E 02 S 2.377296E 02 3.900000E 02 S 2.354565E 02 4.500000E 02 S 2.334258E 02 4.500000E 02 S 2.316098E 02 4.800000E 02 S 2.295850E 02 5.100000E 02 S 2.285301E 02 5.400000E 02 S 2.285301E 02 5.700000E 02 S 2.260584E 02 6.00000E 02 S 2.250109E 02 6.300000E 02 S 2.250109E 02 6.600000E 02 S 2.240714E 02 6.900000E 02 S 2.232284E 02 6.900000E 02 S 2.217928E 02 7.500000E 02 S 2.21832E 02 7.500000E 02 S 2.21832E 02 7.500000E 02 S 2.206357E 02 8.100000E 02 S 2.201442E 02 8.400000E 02 S 2.197027E 02 8.700000E 02 S 2.193061E 02 9.000000E 02 S 2.189498E 02
4.20000CE 02 S 2.334258E 02 4.500000E 02 S 2.316098E 02 4.50000CE 02 S 2.295850E 02 5.1000C0E 02 S 2.285301E 02 5.40000CE 02 S 2.272267E 02 5.7000CE 02 S 2.260584E 02 6.00000CE 02 S 2.250109E 02 6.30000CE 02 S 2.240714E 02 6.60000CE 02 S 2.244718E 02 7.20000CE 02 S 2.217928E 02 7.5000CE 02 S 2.211832E 02 7.5000CE 02 S 2.211832E 02 7.50000CE 02 S 2.201442E 02 8.40000CE 02 S 2.197027E 02 8.70000CE 02 S 2.193061E 02 9.0000CCE 02 S 2.189498E 02
5.1000C0E 02 S 2.285301E 02 5.4000C6E 02 S 2.272267E 02 5.7000C0E 02 S 2.260584E 02 6.000000E 02 S 2.250109E 02 6.300000E 02 S 2.240714E 02 6.600000E 02 S 2.232284E 02 6.900C00E 02 S 2.224718E 02 7.2000C0E 02 S 2.217928E 02 7.5000C0E 02 S 2.211832E 02 7.600000E 02 S 2.211832E 02 7.600000E 02 S 2.201442E 02 8.400000E 02 S 2.197027E 02 8.70000C0E 02 S 2.193061E 02 9.0000C0E 02 S 2.189498E 02
5.1000C0E 02 S 2.285301E 02 5.4000C6E 02 S 2.272267E 02 5.7000C0E 02 S 2.260584E 02 6.000000E 02 S 2.250109E 02 6.300000E 02 S 2.240714E 02 6.600000E 02 S 2.232284E 02 6.900C00E 02 S 2.224718E 02 7.2000C0E 02 S 2.217928E 02 7.5000C0E 02 S 2.211832E 02 7.600000E 02 S 2.211832E 02 7.600000E 02 S 2.201442E 02 8.400000E 02 S 2.197027E 02 8.70000C0E 02 S 2.193061E 02 9.0000C0E 02 S 2.189498E 02
5.1000C0E 02 S 2.285301E 02 5.4000C6E 02 S 2.272267E 02 5.7000C0E 02 S 2.260584E 02 6.000000E 02 S 2.250109E 02 6.300000E 02 S 2.240714E 02 6.600000E 02 S 2.232284E 02 6.900C00E 02 S 2.224718E 02 7.2000C0E 02 S 2.217928E 02 7.5000C0E 02 S 2.211832E 02 7.600000E 02 S 2.211832E 02 7.600000E 02 S 2.201442E 02 8.400000E 02 S 2.197027E 02 8.70000C0E 02 S 2.193061E 02 9.0000C0E 02 S 2.189498E 02
5.40000CE 02 S 2.272267E 02 5.70000CE 02 S 2.260584E 02 6.000000E 02 S 2.250109E 02 6.30000CE 02 S 2.240714E 02 6.60000CE 02 S 2.232284E 02 6.90000CE 02 S 2.224718E 02 7.20000CE 02 S 2.217928E 02 7.50000CE 02 S 2.211832E 02 7.50000CE 02 S 2.211832E 02 7.50000CE 02 S 2.201442E 02 8.40000CE 02 S 2.197027E 02 8.70000CE 02 S 2.193061E 02 9.0000COE 02 S 2.189498E 02
5.700000E 02 S 2.260584E 02 6.000000E 02 S 2.250109E 02 6.600000E 02 S 2.240714E 02 6.600000E 02 S 2.232284E 02 6.900000E 02 S 2.217928E 02 7.200000E 02 S 2.211832E 02 7.500000E 02 S 2.21832E 02 7.500000E 02 S 2.206357E 02 8.100000E 02 S 2.201442E 02 8.400000E 02 S 2.197027E 02 8.700000E 02 S 2.193061E 02 9.000000E 02 S 2.189498E 02
6.3C0000E 02 S 2.240714E 02 6.600000E 02 S 2.232284E 02 6.900000E 02 S 2.224718E 02 7.20000CE 02 S 2.217928E 02 7.500000E 02 S 2.211832E 02 7.800000E 02 S 2.206357E 02 8:103000E 02 S 2.201442E 02 8.400000E 02 S 2.19702TE 02 8.70000CE 02 S 2.193061E 02 9.0000C0E 02 S 2.189498E 02
7.500000E 02 S 2.211832E 02 7.800000E 02 S 2.206357E 02 8.100000E 02 S 2.201442E 02 8.400000E 02 S 2.197027E 02 8.700000E 02 S 2.193061E 02 9.000000E 02 S 2.189498E 02
7.500000E 02 S 2.211832E 02 7.800000E 02 S 2.206357E 02 8.100000E 02 S 2.201442E 02 8.400000E 02 S 2.197027E 02 8.700000E 02 S 2.193061E 02 9.000000E 02 S 2.189498E 02
7.500000E 02 S 2.211832E 02 7.800000E 02 S 2.206357E 02 8.100000E 02 S 2.201442E 02 8.400000E 02 S 2.197027E 02 8.700000E 02 S 2.193061E 02 9.000000E 02 S 2.189498E 02
7.500000E 02 S 2.211832E 02 7.800000E 02 S 2.206357E 02 8.100000E 02 S 2.201442E 02 8.400000E 02 S 2.197027E 02 8.700000E 02 S 2.193061E 02 9.000000E 02 S 2.189498E 02
7.800000E 02 S 2.206357E 02 8:103000E 02 S 2.201442E 02 8.400000E 02 S 2.19702TE 02 8.70000CE 02 S 2.193061E 02 9.0000C0E 02 S 2.189498E 02
8.400000E 02
9.0000CUE 02 S 2.189498E 02
9.0000CUE 02 S 2.189498E 02
3.000000E 02 S 2.189498E 02
9.300000E 02 S 2.186208E 02
9.600000E 02 S 2.183422E 02
9.900000E 02 S 2.180839E 02
1.020000E 03 S 2.178517E 02
1.0500G0E 03 S 2.176432E 02
1.080000E 03 S 2.174558E 02 1.110000E 03 S 2.172873E 02
1.1100C0E 03
1.170000E 03 S 2.169999E 02
1.200000E 03 S 2.168777E 02
1.230000E 03 S 2.167678E 02
1.260000E 03 S 2.166690E 02
1.290000E 03 S 2.165802E 02 1.320000E 03 S 2.165004E 02
1.320000E 03 S 2.165004E 02 1.350000E 03. S 2.164287E 02

TIME	TYPE	VALUE
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3.000000E 01	S	2.939604E 02
6.000000E 01	S	2.836946E 02
9.000000E 01	S	2.746729E 02
1.200000E 02	\$	2.668035E 02
1.500000E C2	S	2.599419E 02
1.800000E 02		2.539440E 02
2.100000E 02	s s	2.486829E 02
2,400000E 02	S	2.440520E G2
2.700000E 02	Š	2.399628E 02
3.000000E 02	S	2.363418E 02
3.300000E 02	S	2.331275E 02
3.600000E 02	S	2.302689E 02
3.900000E 02	S	2.277216E 02
4.200000E 02	S	2.254489E 02
4.500000E 02	S	2.234185E 02
4.800000E 02	S	2.216028E 02
5.100000E 02	S S	2.199780E 02
5.400000£ 02	S	2.185226E 02
5.700000E 02	S	2.172187E 02
6.000000E 02	S	2.160496E 02
6.300000E 02	S	2.150009E 02
6.600000E 02	S	2.140601E 02
6.900000E 02	S	2.132157E 02
7.200000E 02	S	2.124576E 02
7.500000E 02	\$	2.117771E 02
7.800000E 02	S	2.111658E 02
8.100000E 02	S	2.106167E 02
8.400000E 02	555555	2,1012395 02
8.700000E 02	S	2.096910E 02
9.000000E 02	S	2.092829E 02
9.300000E 02	S	2.089254E 02
9.600000E 02	s s	2.086040E 02
9.900000E 02		2.083153E 02
1.020000E 03	S	2.080559E 02
1.050000E 03	S	2.078227E 02
1.0800C0E 03	S S	2.076132E 02
1.11000CE G3	S	2.074249E 02
1.140000E 03	S	2.072557E 02
1.170000E 03	S	2.071036E 02
1.200000E 03	s	2.0696698 02
1.230000E 03	S	2.068440E 02
1.260000E 03	S	2.067335E 02
1.290000E 03	S	2.066341E 02
1.320000E 03	Š	2.065448E 02
1.350000E 03	S	2.064647E 02

TEMPERATURE VECTOR

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TIME	TYPE	VALUE
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9.000000E 01 1.200000E 02	s s s s s s	2.933445E 02 2.919236E 02
1.500000E 02	S	2.901902E 02
1.800000E 02 2.100000E 02	5 5	2.886216E 02 2.872031E 02
2.400000E 02	Š	2.859224E 02
2.700000E 02 3.000000E 02	s s s	2.847678E 02 2.837286E 02
3.300000E 02	S S	2.827944E 02
3.600000E 02 3.900000E 02	S	2.819551E 02 2.812014E 02
4.2000COE 02	Š	2.805254E 02
4.500000E 02 4.800000E 02	5 5 5	2.799189E 02 2.793750E 02
5.100000E 02	S	2.788S75E 02
5.400000E 02 5.700000E 02	S	2.784500E 02 2.780579E 02
6.000000E 02	s s s	2.780579E 02 2.777063E 02
6.300000E 02 6.600000E 02	S	2.773909E 02 2.771079E 02
6.900000E 02	S S S	2.771079E 02 2.768542E 02
7.200000E 02	S	2.7662675 02
7.500000E 02 7.600000E 02	s s	2.764224E 02 2.762390E 02
8.1000COE 02	S	2.760745E 02
8.400000E 02 8.700000E 02	S S	2.759270E 02 2.757944E 02
9.0000CGE 02	5 5 5 5	2.756755E 02
9.300000E 02 9.600000E 02	\$ \$	2.755686E 02 2.754727E 02
9.900000E 02	S	2.753865E 02
1.020000E 03	s s	2.753091E 02 2.752397E 02
1.0800CGE 03	S	2.751772E 02
1.110000E 03 1.140000E 03	s s	2.751211E 02 2.750708E 02
1.170000E 03		2.750256E 02
1.200000E 03 1.230000E 03	S S	2.749849E 02 2.749485E 02
1.26000GE 03	s s	
1.290000E 03 1.320000E 03	s s	2.748860E 02
1.320000E 03 1.350000E 03	S	2.748596E 02 2.748357E 02

7.44		TV05		
TIME O.O		TYPE S	VALUE 3.000000E 02	
3.000000E	01	S	2.973813E 02	
6.000000E	01	Š	2.927502E 02	
9.00000E	01	S	2.884094E 02	
1.200000E	02	S	2.844219E 02	
1.500000E	02	S	2.807952E 02	
1.500000E 2.100000E	02 02	S	2.775149E 02 2.745571E 02	
2.400000E	02	s s	2.745571E 02 2.718958E 02	
2.700000E	02	š	2.695044E 02	
3.000000E	02	S	2.673574E 02	
3.300000E	02	S	2.654314E 02	
3.600000E	02	S	2.637041E 02	
3.900000E	02	S	2.621553E 02	
4.200000E 4.500000E	02 02	S S	2.607668E 02 2.595225E 02	
4.800000E	02	S	2.584070E 02	
5.100000E	02	Š	2.574070E 02	
5.4000COE	02	Š	2.565105E 02	
5.700000E	02	S S	2.557068E 02	
6.0000CCE	02	S	2.549862E 02	
6.300000E	02	s s	2.543399E 02	
6.600000E	02 02	5 5	2.537601E 02 2.532400E 02	
7.20000CE	02	S	2.5324001 02	
7.500000E	02	Š	2.523547E 02	
7.800000E	02	S	2.519789E 02	
8.100000E	02	5	2.516416E 02	
8.4000COE	02	s s s	2.513397E 02	
8.700000E 9.000000E	02 02	S	2.510669E 02 2.508229E 02	
9.300000E	02	S S	2.508229E 02 2.506038E 02	
9.600000E	02	S	2.504069E 02	
9.90000E	02	s s	2.502302E 02	
1.020000E	03	S	2.500714E 02	
1.050000E	03	S	2.499288E 02	
1.080000E	03	s	2.493007E 02	
1.110000E 1.140000E	03	S	2.496857E 02 2.495822E 02	
1.170000E	03	Š	2.494894E 02	
1.200000E	03	s s s s s s	2.494059E 02	
1.230000E	03	S	2.493309E 02	
1.260000E	03	S	2.492635E 02	
1.290000E	03	S	2.492030E 02	
1.320000E	03	S S	2.491486E 02	
1.350000E	ΟЗ.	5	2.490997E 02	

TIME		TVOS	N. N. 115	
0.0		TYPE S	VALUE 3.000000E	02
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6.000000E	01	S	2.847383E	02
9.000000E	01	S	2.767437E	02
1.2000C0E	02	S	2.698711E	02
1.500000E	02	S	2.6389265	02
1.800000E	02	S S S S S	2.586531E	02
2.10000CE	02	5	2.540391E	02
2.400000E 2.700000E	02 02	S S	2.499608E	02
3.000000E	02	5 S	2.463459E 2.431346E	02 02
3.300000E	02		2.402769E	02
3.600CCOE	02	S	2.377297E	02
3.900000E	02	Š	2.354565E	02
4.200000E	02	s s s s	2.334259E	02
4.500000E	02	S	2.316100E	02
4.600000E	02	S	2.299851E	02
5.100000E 5.40000CE	02	S	2.285302E	02
5.70000CE	02 02	5	2.272267E 2.260585E	02 02
6.000000E	02	S	2.250110E	02
6.3000COE	02	S	2.240714E	02
6.60000GE	02	S	2.232284E	02
6.9000CGE	02	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	2.224719E	02
7.200GOGE	02	S	2.217929E	02
7.50000GE	02	Ş	2.211833E	02
7.8C0000E	02	S	2.2063588	C2
8.100000E 8.400000E	02	S	2.261442E	02
8.700000E	02 02	2	2.197028E	02 02
9.000000E	02	5555	2.193062E 2.169499E	02
9.300000E	02	5	2.1862998	02
9.6000CDE	02	Š	2.183423E	02
9.90J000E	02	S	2.1808405	02
1.0200C0E	03	S	2.1735198	02
1.050000E	03	s s s s s	2.176433E	02
1.080000E	03	S	2.174559E	02
1.1100CCE 1.1400COE	03	Ş	2.172874E	02
1.140000E 1.1700C0E	03		2.171360E 2.169999E	02 02
1.2000COE	03	\$ 5	2.169999E 2.168777E	02
1.230000E	03	Š	2.167678E	02
1.26000CE	03	\$ \$ \$ \$	2.166691E	02
1.290000E	03	5	2.165803E	02
1.320000E	03	S	2.165004E	02
1.350000E	03	S	2.164288E	02

	•
TIME TYPE VALU	F
0.0 \$ 3.00000	
3.000000E 01 S 2.93960	
6.000000E 01 S 2.83694	
9.000000E 01 S 2.74673	
1.200000E 02 S 2.66803	
1.500000E 02 S 2.59941	
1.500000E 02 S 2.59941 1.600000E 02 S 2.53944	
2.100000E 02 S 2.486E3	
2.400000E 02 S 2.44052	
2.700000E 02 S 2.39962	
3.000000E 02 S 2.36341	
3.300000E 02 S 2.33127	
3.600000E 02 S 2.30268	
3.900000E 02 S 2.27721	
4.200000E 02 S 2.25449	
4.500000E 02 S 2.23418	
4.800000E 02 S 2.21603	
5.100000E 02 S 2.19978	
5.4000CQE 02 S 2.18522	
5.7000G0E 02 S 2.17218	
6.00000CE 02 S 2.16049	
6.300000E 02 \$ 2.15000	
6.600000E 02 S 2.14060	
6.900000E 02 \$ 2.13215	
7.200000E 02 S 2.12457	
7.500000E 02 S 2.11777	
7,800000E 02 S 2,11165	8E 02
8.100000E Q2 S 2.10816	
8.400000E 02 S 2.10123	
8.400000E 02 S 2.10123 8.700000E 02 S 2.09681 9.000000E 02 S 2.09283	
9.000000E 02 S 2.09283	
9.300000E 02 S 2.08925	45 02
9.600000E 02 S 2.08604	1E 02
9.900000E 02 \$ 2.08315	3E 02
1.020000E 03 S 2.08056	OE 02
1.050000E 03 S 2.07822	8E 02
1.080000E 03 S 2.07613	3E 02
1.110000E 03 S 2.07425	OE 02
1.140000E 03 S 2.07255	7E 02
1.170000E 03 S 2.07103	7E 02
1.110000E 03	9E 02
1.230000E 03	OE 02
1.260000E 03	
1.290000E 03 S 2.06634	2E 02
1.35000E 03 S 2.06464	

TIME	TYPE	VALUE
0.0 3.000000E 01	s s	3.000000E 02 2.999993E 02
6.000000E 01 9.000000E 01	S S	2.999995E 02 2.999993E 02
1.200000E 02	S	2.999988E 02
1.500000E 02 1.8000C0E 02	. s s	2.999990E 02 2.999988E 02
2.100000E 02 2.400000E 02	S	2.993988E 02 2 999988E 02
2.700000E 02	s s s	2.999988E 02
3.000000E 02 3.300000E 02	5 5 5	2.999988E 02 2.999985E 02
3.600000E 02 3.900000E 02	s s	2,999980E 02 2,999985E 02
4.200000E 02 4.500000E 02	S S	2.999980E 02 2.999985E 02
4.800000E 02	S	2.999980E 02
5.100000E 02 5.400000E 02	s s	2.999983E 02 2.999983E 02
5.7000C0E 02 6.00000CE 02	S	2.999980E 02 2.999983E 02
6.300000E 02	S S S	2.999980E 02
6.600000E 02 6.900000E 02	S	2.999983E 02 2.999980E 02
7.200000E G2 7.500000E G2	S S	2.999983E 02 2.999980E 02
7.800000E 02 8.100000E 02	S	2.999983E 02 2.999980E 02
8.400000E 02	s s	2.999983E 02
8.700000E 02 9.000000E 02	S	2.999980E 02 2.999983E 02
9.300000E 02 9.600000E 02	S S	2.999980E 02 2.999983E 02
9.900000E 02	Ş	2.999980E 02
1.020000E 03 1.050000E 03	s s s	2.999980E 02 2.999980E 02
1.080000E 03 1.110000E 03	s s	2.999980E C2 2.999980E O2
1.140000E 03 1.170000E 03	S	2.999980E 02 2.999980E 02
1.200000E 03	s s s	2.999980E 02
1.230000E 03 1.260000E 03	S S	2.999980E 02 2.999980E 02
1.290000E 03 1.320000E 03	S S S	2.999980E 02 2.999980E 02
1.350000E 03	š	2.999980E 02

```
......
NASTRAN LOADED AT LOCATION 16DF20
TIME TO GO = 59 CPU SEC., 299 I/O SEC.
    O CPU-SEC.
                      O ELAPSED-SEC.
                                         SEM1 BEGN
    O CPU-SEC.
                      O ELAPSED-SEC.
                                         SEMT
    1 CPU-SEC.
                      4 ELAPSED-SEC.
                                         NAST
     1 CPU-SEC.
                      4 ELAPSED-SEC.
                                         GNFI
    1 CPU-SEC.
                      4 ELAPSED-SEC.
                                         XCSA
    1 CPU-SEC.
                      7 ELAPSED-SEC.
                                         IFF1
    1 CPU-SEC.
                     10 ELAPSED-SEC.
                                         XSOR
    2 CPU-SEC.
                     15 ELAPSED-SEC.
                                           DO
                                              IFP
    2 CPU-SEC.
                                          END
                                              IFP
                     27 ELAPSED-SEC.
     2 CPU-SEC.
                     27 ELAPSED-SEC.
                                         XGPI
     4 CPU-SEC.
                      34 ELAPSED-SEC.
                                         SEM1
                                               END
                     34 ELAPSED-SEC.
                                               LINKNSO2 ---
     4 CPU-SEC.
    24 I/O SEC.
LAST LINK DID NOT USE 40016 BYTES OF OPEN CORE
                     36 ELAPSED-SEC.
                                         ---- LINK END ---
     4 CPU-SEC.
                                         XSFA
     4 CPU-SEC.
                      36 ELAPSED-SEC.
     4 CPU-SEC.
                      37 ELAPSED-SEC.
                                         XSFA
     4 CPU-SEC.
                     17 ELAPSED-SEC.
                                         3
                                               GP1
                                                       BEGN
     5 CPU-SEC.
                                               GP1
                      43 ELAPSED-SEC.
                                         3
                                                       END
     5 CPU-SEC.
                      47 ELAPSED-SEC.
                                         8
                                               GP2
                                                       BEGN
                                               GP2
     5 CPU-SEC.
                      418 ELAPSED-SEC.
                                                       END
                     50 ELAPSED-SEC.
                                               PLISET
                                                       BEGN
     5 CPU-SEC.
                                         10
                      51 ELAPSED-SEC.
                                               PLISET
                                                       END
     5 CPU-SEC.
                                         10
                                               PRTMSG
                                                       BEGN
     5 CPU-SEC.
                      51 ELAPSED-SEC.
                                         12
     5 CPU-SEC.
                      52 ELAPSED-SEC.
                                         12
                                               PRTMSG
                                                       END
     5 CPU-SEC.
                      52 ELAPSED-SEC.
                                         13
                                               SETVAL
                                                       BEGN
     5 CPU-SEC.
                     52 ELAPSED-SEC.
                                               SETVAL
                                                       END
                                         13
                                                       BEGN
     5 CPU-SEC.
                     55 ELAPSED-SEC.
                                         21
                                               GP3
     5 CPU-SEC.
                      62 ELAPSED-SEC.
                                               GP3
                                                       END
                                         21
                                               TA1
                                                       BEGN
                                         23
     5 CPU-SEC.
                      64 ELAPSED-SEC.
                                               TA1
                                                       END
     6 CPU-SEC.
                      75 ELAPSED-SEC.
                                         23
                      78 ELAPSED-SEC.
                                               LINKNSO3 ---
     6 CPU-SEC.
    62 I/O SEC.
LAST LINK DID NOT USE 82788 BYTES OF OPEN CORE
                                               LINK END ---
     6 CPU-SEC.
                      81 ELAPSED-SEC.
                                         ----
     5 CPU-SEC.
                      81 ELAPSED-SEC.
                                         27
                                               SMA1
                                                       BEGN
     6 CPU-SEC.
                      85 ELAPSED-SEC.
                                         27
                                               SMA1
                                                       END
     6 CPU-SEC.
                      87 ELAPSED-SEC.
                                         30
                                               SMA2
                                                       BEGN
                                         30
                                               SMA2
                                                       END
    6 CPU-SEC.
                      90 ELAPSED-SEC.
                                               LINKNSO5 ---
     6 CPU-SEC.
                      93 ELAPSED-SEC.
    73 I/O SEC.
LAST LINK DID NOT USE 64268 BYTES OF OPEN CORE
     6 CPU-SEC.
                      96 ELAPSED-SEC.
                                               LINK END - -
                                         35
                                               RMG
                                                       BEGN
     6 CPU-SEC.
                      96 ELAPSED-SEC.
                                               MP
     6 CPU-SEC.
                      99 ELAPSED-SEC.
                                         SDCO
                                               MP
     6 CPU-SEC.
                     100 ELAPSED-SEC.
                                         SDCO
     6 CPU-SEC.
                     100 ELAPSED-SEC.
                                         FBS
                     102 ELAPSED-SEC.
                                         F3S
     6 CPU-SEC.
                                         MPYA
     6 CPU-SEC.
                     103 ELAPSED-SEC.
                                               Ď
                                               METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                         MPYA
     7 CRU-SEC.
                     104 ELAPSED-SEC.
                                               D
     7 CPU-SEC.
                     105 ELAPSED-SEC.
                                         TRAN
                                              POSE
   . 7 CPU-SEC.
                     106 ELAPSED-SEC.
                                         TRAN POSE
```

MPYA D

106 ELAPSED-SEC.

7 CPU-SEC.

```
METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                  0.0
                                           MPYA D
                     107 ELAPSED-SEC.
     7 CPU-SEC.
     7 CPU-SEC.
                     109 ELAFSED-SEC.
                                           35
                                                  RMG
                                                          END
                                           ---- LINKNSO4 ---
     7 CPU-SEC.
                     113 ELAPSED-SEC.
    91 I/O SEC.
LAST LINK DID NOT USE 72520 BYTES OF CPEN CORE
                                           ---- LINK END ---
     7 CPU-SEC.
                     118 ELAFSED-SEC.
                                                          BEGN
     7 CPU-SEC.
                      118 ELAPSED-SEC.
                                           40
                                                  GP4
     7 CPU-SEC.
                      122 ELAPSED-SEC.
                                           40
                                                  GP4
                                                          END
     8 CPU-SEC.
                     1:6 ELAPSED-SEC.
                                           46
                                                  GPSP
                                                          BEGN
                                           46
                                                  GPSP
                                                          END
     8 CPU-SEC.
                     126 ELAPSED-SEC.
                                                  LINKNS14 ---
                     126 ELAPSED-SEC.
     8 CPU-SEC.
                                           ----
   101 I/O SEC.
LAST LINK DID NOT USE 117044 BYTES OF OPEN CORE
     3 CPU-SEC.
                                           ---- LINK END ---
                     101 ELAPSED-SEC.
                                           47
                                                  OFP
                                                          BEGN
     3 CPU-SEC.
                      131 ELAPSED-SEC.
     8 CPU-SEC.
                      131 ELAPSED-SEC.
                                           47
                                                  OFP
                                                          END
     8 CPU-SEC.
                      133 ELAPSED-SEC.
                                                  LINKNSO4 ---
   104 I/O SEC.
LAST LINK DID NOT USE 115664 BYTES OF OPEN CORE
                                            ---- LINK END ---
     8 CPU-SEC.
                      136 ELAPSED-SEC.
                                                          BEGN
     a CPU-SEC.
                      136 ELAPSED-SEC.
                                            51
                                                  MCE1
     B CPU-SEC.
                      139 ELAPSED-SEC.
                                                  MCE1
                                                          END
                                            51
     8 CPU-SEC.
                      140 ELAPSED-SEC.
                                            53
                                                  MCE2
                                                          BEGN
     8 CPU-SEC.
                      142 ELAPSED-SEC.
                                           MPYA
                                                  D
                                                                                                  0.0
                                                                             1.EST. TIME =
                                                  METHOD 2 NT.NBR PASSES =
                                            MPYA
     8 CPU-SEC.
                      144 ELAPSED-SEC.
                                                  D
                      144 ELAPSED-SEC.
     3 CPU-SEC.
                                            MPYA
                                                  METHOD 2 T .NBR PASSES =
                                                                              1.EST. TIME =
                                                                                                  0.0
     8 CPU-SEC.
                      145 ELAPSED-SEC.
                                            MPYA
                                                  D
                                            MPYA
     9 CPU-SEC.
                      146 ELAPSED-SEC.
                                                  D
                                                  METHOD 2 T .NBR PASSES =
                                                                              1.EST. TIME =
                                                                                                  0.0
     9 CPU-SEC.
                      147 ELAPSED-SEC.
                                            MPYA
     9 CPU-SEC.
                      150 ELAPSED-SEC.
                                            MPYA
                                                  METHOD 2 NT, NBR PASSES =
                                                                              1,EST. TIME =
                                                                                                  0.0
     9 CPU·SEC.
                      152 ELAPSED-SEC.
                                            MPYA
     9 CPU-SEC.
                      152 ELAPSED-SEC.
                                            MPYA
                                                  METHOD 2 T .NBR PASSES =
                                                                              1.EST. TIME =
                                                                                                  0.0
     9 CPU-SEC.
                      154 ELAPSED-SEC.
                                            MPYA D
    10 CPU-SEC.
                      155 ELAPSED-SEC.
                                            MPYA
                                                  D
                                                  METHOD 2 T .NBR PASSES =
                                                                              1,EST. TIME =
                                                                                                  0.0
                                            MPYA D
    10 CPU-SEC.
                      156 ELAPSED-SEC.
    10 CPU-SEC.
                      159 ELAPSED-SEC.
                                            MPYA
                                                  D
                                                  METHOD 2 NT, NBR PASSES =
                                                                              1.EST. TIME =
                                                                                                  0.0
    10 CPU-SEC.
                      161 ELAPSED-SEC.
                                            MPYA
                                                  D
    10 CPU-SEC.
                      161 ELAPSED-SEC.
                                            MPYA
                                                  METHOD 2 T .NBR PASSES =
                                                                              1.EST. TIME =
                                                                                                  0.0
    10 CPU-SEC.
                      162 ELAPSED-SEC.
                                            MPYA D
    10 CPU-SEC.
                      162 ELAPSED-SEC.
                                            MPYA
                                                  METHOD 2 T .NBR PASSES =
                                                                              1.EST. TIME =
                                                                                                  0.0
    11 CPU-SEC.
                                            MPYA
                      163 ELAPSED-SEC.
                                                  D
    11 CPU-SEC.
                      163 ELAPSED-SEC.
                                            53
                                                  MCE2
                                                           END
                                            XSFA
    11 CPU-SEC.
                      170 ELAPSED-SEC.
    11 CPU-SEC.
                      171 ELAPSED-SEC.
                                            XSFA
    11 CPU-SEC.
                      171 ELAPSED-SEC.
                                                  LINKNSO6 ---
   131 I/O SEC.
LAST LINK DID NOT USE 101876 BYTES OF OPEN CORE
                                                  LINK END ---
    11 CPU-SEC.
                      173 ELAPSED-SEC.
                                            ----
     11 CPU-SEC.
                      173 ELAPSED-SEC.
                                            75
                                                  DPD
                                                           BEGN
    11 CPU-SEC.
                      177 ELAPSED-SEC.
                                            75
                                                  DPD
                                                           END
                                                  LINKNS10 ---
    11 CPU-SEC.
                      181 ELAPSED-SEC.
                                            ----
   143 I/G SEC.
LAST LINK DID NOT USE 116420 BYTES OF OPEN CORE
    12 CPU-SEC.
                      184 ELAPSED-SEC.
                                           ---- LINK END ---
```

```
12 CPU-SEC.
                      184 FLARSED-SEC.
                                           81
                                                 MTRXIN
                                                          REGN
    12 CPU-SEC.
                      165 ELAPSED-SEC.
                                           81
                                                 MTRXIN
                                                          END
    12 CPU-SEC.
                      186 E'APSED-SEC.
                                           83
                                                  PARAM
                                                          PEGN
    12 CPU-SEC.
                                                  PARAM
                      186 ELAPSED-SEC.
                                           83
                                                          END
    12 CPU-SEC.
                      188 ELAPSED-SEC.
                                           XSEA
    12 CPU-SEC.
                      188 FLAPSED-SEC.
                                           SSEA
    12 CPU-SEC.
                                                 GKAD
                                                          REGN
                     188 ELAPSED-SEC.
                                           RΩ
    12 CPU-SEC.
                     190 ELAPSED-SEC.
                                           88
                                                  GKAD
                                                          FND
    12 CPU-SEC.
                      192 ELAPSED-SEC.
                                                 LINKNSC5 ---
   151 I/O SEC.
LAST LINK DID NOT USE 117060 BYTES OF OPEN CORE
                                           ---- LINK END ---
    12 CPU-SEC.
                      194 ELAPSED-SEC.
    12 CPU-SEC.
                      194 ELAPSED-SEC.
                                           92
                                                 TRLG
                                                          BEGN
    12 CPU-SEC.
                     202 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 T .NBR PASSES =
                                                                              1.EST. TIME =
                                                                                                  0.0
    12 CPU-SEC.
                      203 FLAPSED-SEC.
                                           MPYA D
    13 CPU-SEC.
                     205 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 NT.NBR PASSES =
                                                                              1.EST. TIME =
                                                                                                  0.0
    13 CPU-SEC.
                                           MPYA D
                      207 ELAPSED-SEC.
    13 CPU-SEC.
                      207 ELAPSED-SEC.
                                           MPYA D
                                                                                                  0.0
                                                 METHOD 2 NT.NBR PASSES =
                                                                              1.EST. TIME =
    13 CPU-SEC.
                      208 ELAPSED-SEC.
                                           MPYA D
    13 CPU-SEC.
                     208 FLAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                  \alpha. \alpha
    13 CPU-SEC.
                      209 FLAPSED-SEC.
                                           MPYA D
   -13 CPH-SEC
                     210 ELAPSED-SEC.
                                           92
                                                 TRLG
                                                          FND
    14 CPU-SEC.
                     2:2 ELAPSED-SEC.
                                            ---- LINKNS11 ---
   167 I/O SEC.
LAST LINK DID NOT USE 58176 BYTES OF OPEN CORE
    14 CPU-SEC.
                     215 ELAPSED-SEC.
                                            ---- LINK END ---
    14 CPU-SEC.
                     2:5 ELAPSED-SEC.
                                            97
                                                 TRHT
                                                          BEGN
                     2.8 ELAPSED-SEC.
                                           DECO MP
    14 CPU-SEC.
    14 CPU-SEC.
                     219 ELAPSED-SEC.
                                           DECO MP
    18 CPU-SEC.
                     269 FLAPSED-SEC.
                                            97
                                                 TRHT
                                                          END
                                                 LINKNS12 ---
    16 CPU-SEC.
                     271 ELAPSED-SEC.
                                            ----
   228 I/O SEC.
LAST LINK DID NOT USE 69268 BYTES OF OPEN CORE
    16 CPU-SEC.
                      277 ELAPSED-SEC.
                                            ---- LINK END ---
    16 CPU-SEC.
                      277 ELAPSED-SEC.
                                           99
                                                  VDR
                                                          BEGN
    16 CPU-SEC.
                      280 ELAPSED-SEC.
                                            99
                                                  VDR
                                                          END
                                                          BEGN
    16 CPU-SEC.
                      281 ELAPSED-SEC.
                                                  PARAM
                                           111
                                                          END
    16 CPU-SEC.
                      281 ELAPSED-SEC.
                                            111
                                                  PARAM
    16 CPU-SEC.
                     282 ELAPSED-SEC.
                                           XSFA
                      282 ELAPSED-SEC.
    16 CPU-SEC.
                                           XSFA
    16 CPU-SEC.
                                                 SDR1
                                                          BEGN
                     282 ELAPSED-SEC.
                                           115
    16 CPU-SEC.
                      283 ELAPSED-SEC.
                                           MPYA D
                                                  METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                  0.1
    16 CPU-SEC.
                      284 ELAPSED-SEC.
                                           MPYA D
                      287 ELAPSED-SEC.
                                           115 SDR1
                                                          END
    17 CPU-SEC.
                                            ---- LINKNSO8 ---
    17 CPU-SEC.
                      289 ELAPSED-SEC.
   240 I/O SEC.
LAST LINK DID NOT USE 119096 EYTES OF OPEN CORE
    17 CPU-SEC.
                     293 ELAPSED-SEC.
                                           ---- LINK END ---
                                                 PLTTRAN BEGN
    17 CPU-SEC.
                      293 ELAPSED-SEC.
                                           118
                                                 PLTTRAN END
    17 CPU-SEC.
                      294 ELAPSED-SEC.
    17 CPU-SEC.
                      294 ELAPSED-SEC.
                                            ---- LINKNS13 ---
   244 I/O SEC.
LAST LINK DID NOT USE 114512 BYTES OF OPEN CORE
                                           ---- LINK END ---
    17 CPU-SEC.
                     297 ELAPSED-SEC.
                                                          BEGN
    17 CPU-SEC.
                      297 ELAPSED-SEC.
                                           120
                                                  SDR2
    17 CPU-SEC.
                     299 ELAPSED-SEC.
                                           120
                                                 SDR2
                                                          END
    17 CPU-SEC.
                     300 ELAPSED-SEC.
                                                 LINKNS14 ---
  250 1/0 SEC.
```

LAST LINK DID NOT USE 66428 BYTES OF OPEN CORE

```
18 CPU-SEC.
                   304 ELAPSED-SEC.
                                     121 SDR3
                                                    BEGN
    18 CPU-SEC.
                   308 ELAPSED-SEC.
                                            SDR3
                                       121
                                                    END
    18 CPU-SEC.
                   310 ELAFSED-SEC.
                                       123 OFP
                                                    BEGN
   19 CPU-SEC.
                   312 ELAPSED-SEC.
                                       123 OFP
                                                    END
   19 CPU-SEC.
                   312 ELAPSED-SEC.
                                       130 XYTRAN BEGN
   19 CPU-SEC.
                   312 ELAPSED-SEC.
                                       130 XYTRAN END
   19 CPU-SEC.
                   313 ELAPSED-SEC.
                                       ---- LINKNSO2 ---
= 262 I/O SEC.
LAST LINK DID NOT USE 11408 BYTES OF OPEN CORE
    19 CPU-SEC.
                   3'9 ELAPSED-SEC.
                                      ---- LINK END ---
    19 CPU-SEC.
                    319 ELAPSED-SEC.
                                       132 XYPLOT BEGN
   19 CPU-SEC.
                    320 ELAPSED-SEC.
                                       132 XYPLOT END
* 19 CPU-SEC.
                    320' ELAPSED-SEC.
                                       138 EXIT
                                                    BEGN
```

---- LINK END ---

= 263 I/O SEC.

18 CPU-SEC.

LAST LINK DID NOT USE 97232 BYTES OF OPEN CORE AMOUNT OF OPEN CORE NOT USED = 11K BYTES

304 ELAPSED-SEC.

Including a continue among the

PAN MEN MANUEL PROGRESSAND FOR UNIVERSIDAD PARTICIPATION OF A PARTICIP

MEDIANCO NON NATA ANALYSIA DINPANDINO NESINASSIA ANSA

ADDITION OF THE STATE OF THE ST

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JUMMIND SUMM MARKAGE IM OWNM MANAGEMENT AND A STATE OF THE S /I'M --MMMMMMM MIMIMIM MMMM MMMM MAGMAMMALL MUNISIMM /// M MA'--MMM Manager 12-874 MMMMMM/// M. MMM MMS3. MMM MMMM MMMM MM LIGHAMARANIANA MARKWAMA M MMMM FOW - - MOTUMM MMMMM MM Marraga 1/1///// ATTN/VARIM MAIM MMM MMM MANAGEMENT PILA MA MM// /// ////mram mmmm - - NMCSCMM DMMAAAAM MMM M MMM MM MMMM MM MMMAR TERMINA Mini 145.4 1111 111 MYSSERVERS M - - - MESSERVES M MAINWAWNER MMM MM MIMMM MM MMMM MM GMMCAMMAGGM MIMMO / /// ///MM KCC MARMMM - - - M MMNUMM MMOUSTAIN MIMIMIMIM MMMM MM MMMMMM LIMMENTALISMENT 11111 1/ 1/1 MINIMUM - - - MANNIM MWWWW MMMARAM M. MAM MMMMMMMMMMM MM MMMMM TIPM MINIMANIAM MARKA M -- - MARKAM -- M MARKAM MEMMIN M MMM MMMM MM MANAM MM7////// MINIMMI MANA ////MMMMMM MINESTAL YEAR MADE MMARKIN ----MM MMM MMMMM MM MM MMMM MMMMMM MMMM MM

RATE PRODUCTION OF THE PRODUCT OF TH

BEBETYSKU (ST. 1905) DEREK - - BER TELEVOREN BETURKARREN VERLAREN ELEKTROMAKET BERREN BER DARFEN. DER BERERREN BEMETER BURGNERMERE B. - - - LEKTOROT BERERREN BETURK BERERREN BERERREN BERERREN BERERREN BETERREN BETURKARREN BETURKT BEBETELLER - - DEMBET BEST GERRANDER DET BURKE BETURK BETURKT BETER BETER BETER BETERREN BETERREN BETER

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- мимлометомия поставления подать поставления подать подат

ACCIDENTIFICACIÓN DE PRÉSE ACCIDENTATA DE PROPERCIO AND ESTA CASTANDATA MARÍA
MINISTROMANIC MOSMICAMICA PAINT

SYSTEM GENERATION DATE - 12/31/74

IBM 360-370 SERIES

RIGID FORMAT SERIES M

LEVEL 15.5.3

MODELS 91.95

1111

MAIM

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9
ID CLASS PROBLEM TEN. C.E. JACKSON
IS MAXIMUM CPU TIME ALLOWED FOR THE JOB
TIME 10
IS THE THERMAL ANALYZED FORTION OF NASTRAN IS TO BE USED
APP HEAT
S THE NON-LINEAR TRANSIENT SOLUTION ALGORITHM IS TO BE USED
5
50L 9
IS REQUEST FOR DIAGNOSTIC WHICH PRINTS OUT CONVERGENCE CRITERIA
S PRODUCES OUTPUT ONLY FOR SOL 3
DIAG 18
IS THE FOLLOWING ALTER IS NECESSARY FOR ALL TRANSIENT RESTARTS
S USING THE HEAT TRANSFOR OPTION ... IT IS USED TO CORRECT AN ERROR IN THE
S RESTART TABLES
PLTTRAN HSGPOT.HSIL/HBGPOP.HSIP/V.N.HLUSET/V.N.HLUSEP $
SAVE HEUDER S
ENDALTER
$ ADD THE RESTART DICTICLARY WHICH WAS PUNCHED OUT BY PROBLEM
S NUMBER MINE ... THIS IS ACQUIRED TO RESTART A PROBLEM
RESTART CLASS . PROBLEM . 1/ 1/76, 27120,
        1. XVPS FLAGS = 0.
                                REEL = 1, FILE =
                                                      5
           REENTER AT UNAP SEQUENCE NUMBER 7
       3.
           HGPL , FLAGE = 0.
                                REEL = 1, FILE =
        4.
           HEGE(N), FLAGS = 0.
                                REEL = 1. FILE =
        5.
           FGPDI
                      FLAGS = 0.
                                REEL = 1. FILE =
                                                     8
            HEGPD 1
                      FLAGS = 0.
                                REEL = 1, FILE =
        С,
                                                     9
        7,
            HSIL
                      FEAGS = 0.
                                REEL = 1. FILE =
                                                     10
       €.
            X∀⊇S
                      FLAGS = C.
                                 REEL = 1.
                                           FILE =
                                                     11
       9.
            HOSTO
                      F1.A35 = 0.
                                REEL = 0.
                                           FILE =
                                                     0
                 . FL#G5 = 0.
                                REEL = O. FILE =
       10.
            HUSET
                                                     0
                  . FLAGS = 0, REEL = 0, FilE =
       11.
            HCM
                                                     0
       12.
                   , FLAGG = O, REEL = O. FILE =
                                                      O
           HGO
```

	13.	НКАА		FLAGS = 0,	REEL =	Ο.	FJLE	=	0
	14.	HSAA		FLAGS = 0.	REEL =	Ο.	FILE	=	0
	15.	HPSO		FLAGS = 0.	REEL =	0.	FILE	=	0
	16,	HKFS		FLAGS = 0.	REEL =	0.	FILE	•	С
	17.	HQP		FLAGS = 0.	REEL =	0.	FILE		0
	16.	HEST	•	FLAGS = 0.	REEL =	o.	FILE		0
	19.		ÀΤ	DMAP SEQUENCE		10			_
	20.	HECT		FLAGS = 0,	REEL =	1,	FILE	=	. 12
	21.	XVPS	•	FLAGS = 0.	REEL =	1,	FILE		13
	22.	REENTER	ÀΤ	DMAP SEQUENCE		21			
	23.	XVPS	~ .	FLAGS = 0.	REEL =	1.	FILE	=	14
	24.	HPLTPAR	•	FLAGS = 0.	REEL =		FILE		C
	25.	HGPSETS	•	FL4GS = 0.	REEL =	0.	FILE		ŏ
·	26.	HELSETS	•	FLAGS = 0.	REEL =	o.	FILE		Č
***	27,	REENTER	, _T	EMAP SEQUENCE		23	, , , , ,		J
	28.	HGPTT	Α.	FLAGS = 0.	REEL =	1,	FILE	_	15
	29,	HSLT	•	FLAGS = 0.	REEL =	1.	FILE		16
	30.	XVPS	•	FLAGS = 0.	REEL =	1.	FILE		17
			· .	DMAP SEQUENCE		25	LILL	-	
· · · · · · · · · · · · · · · · · · ·	31. 32.	REENTER HEST	ДΤ	FLAGS = 0.	REEL =	1,	FILE	_	18
			•		REEL =	1,	FILE		19
	3 3.	HECPT	•	FLAGS = 0. FLAGS = 0.	REEL =	1.	FILE		20
	34.	HGPC:	•				FILE		21
	35.	XVPS	:	FLAGS = 0.	REEL =	1.	FILE	-	21
	36.	REEN"ER	Αī	DMAP SEQUENCE		30		_	22
	37,	HKGGX	•	FLAGS = 0.	REEL =	1.	FILE		22
	38.	XVPS	•	FLAGS = 0,	REEL =	1.	FILE		23
	39.	HGPS"	1.	FLAGS = 0.	REEL =	0.	FILE	=	O
	40.	REENTER	ΔŤ			34			0.1
	41.	HEGG	•	FLAGS = 0,	REEL =	1.	FILE		24
	42,	XVPS	•	FLAGS = 0.	REEL =	1.	FILE		25
	43,	HENN		FLAGS = 0.	REEL =	0.	FILE		0
	44.	HBFF	•	FLAGS = 0,	REEL =	0.	FILE	-	0
	45.	REENTER	ΑŢ			40			
	4ö.	HRGG		FLAGS = 0,	REEL =	1.	FILE		26
	47,	HKGG		FLAGS = 0.	REEL =	1,	FILE		27
	48,	HQGE		FLAGS = 0,	REEL =	1.	FILE		28
	49.	XVPS		FLAGS = 0,	REEL =	1.	FILE		29
	50.	HRNN		FLAGS = 0,	REEL =	0.	FILE		0
	51.	HRFF		FLAGS ≈ 0.	REEL =	Ο.	FILE		0
	52,	hRAA		FLAGS = 0.	REEL =	0.	FILE		0
	53.	HEDD		FLAGS = 0.	REEL =	Ο,	FILE	=	0
	54,	REENTER	ΑΤ	DMAP SEQUENCE		45			
	55,	HRG		FLAGS = 0.	REEL =	1.	FILE		30
	56.	HUSET		FLAGS = 0.	REEL =	1.	FILE		31
	57.	XVPS		FLAGS = 0.	REEL ≃	1.	FILF	=	32
	58.	HGMD		FLAGS = 0.	PEEL ≈	Ο.	FILE	=	0
	59.	HGQĐ		FLAGS = O.	REEL =	Ο.	FILE		0
	εo,	HKNN		FLAGS = 0.	REEL =	٥.	FILE	=	0
	61,	REENTER	ΑT	DMAP SEQUENCE	NUMBER	53			
	62,	HGM		FLAGS = 0.	REEL =	1.	FILE	Ξ	33

63.	XVPS		FLAGS = 0,	REEL =	1,	FILE	=	34
64,	REEN"ER	ДΤ	DMAP SEQUENCE	NUMBER	55			
65.	HKNN		FLAGS = 0.	REEL =	1.	FILE	=	35
66°.	HRNN		FLAGS = 0.	REEL =	1.	FILE	=	36
67,	HENN		FLAGS = 0.	REEL =	1.	FILE	=	37
63.	XVPS		FLAGS = 0.	REEL =	1.	FILE	=	38
69.	REENTLR	ΑŢ	DMAP SEQUENCE	NUMBER	58			
70,	HKNN		FLAGS = 4.	REEL =	1.	FILE	=	35
71,	HKFF		FLAGS = 4.	REEL =	1.	FILE	=	35
72.	HRNN		FLAGS = 4.	REEL =	1.	FILE	=	36
73.	HREE		FLAGS = 4.	REEL =	1.	FILE	=	36
74	HENN		FLAGS = 4,	REEL =	1.	FILE		37
75.	HBFF		FLAGS = 4	REEL =	1.	FILE		37
76.	XVPS		FLAGS = 0.	REEL =	1.	FILE		39
77.	REENTER	ÁΤ	CMAP SEQUENCE		64			
78.	HKAA		FLAGS = 4.	REEL =	1.	FILE	=	35
79.	HRAA	•	FLAGS = 4.	REEL =	1.	FILE		36
ac.	HBAA	'	FLAGS = 4.	REEL =	1	FILE		37
81.	XVPS	•	FLAGS = 0.	REEL =	1.	FILE		40
82.	REENTER	i. T		NUMBER	'` 81		_	70
83.	CTBSUH	~ '	FLAGS = 0.	REEL =	1,	FILE	_	41
34.	HECDYN		FLAGS = 0.	REEL =	1.	FILE		42
85.	HDLT	•	FLAGS = 0,	REEL =	1,	FILE		43
86.	HTRL	•	FLAGS = 0.	REEL =	f.	FILE		44
87.	HOM	•	FLAGS = 4.	REEL =	1.	FILE		33
88.	HGVD	•	FLAGS = 4.	REEL =	1.	FILE		33
89.	HSILD	•	FLAGS = 0.	REEL =	1.	FILE		45
90.	HGPLD	•	FLAGS = 0.	REEL =	1.	FILE		46
93. 91.	XVPS	•	TLAGS = 0.	REEL =	1.	FILE		47
92.	HTFPOOL	•	FLAGS = 0.	REEL =	٠. ٥.	FILE		0
93.	HNLFT	•	FLAGS = 0.	REEL =				
99. 94.		•	714GS = 0, 714GS = 0.		0.	FILE		0
95.	HPPO	•		REEL =	0.	FILE		0
96.	HPDO	•	FLAGS = 0.	REEL =	0.	FILE		0
	HPGT	: -	FLAGS = 0,	REEL =	0,	FILE	-	0
97.	REENTER	Ai	DMAP SEQUENCE		87			~ ~
98.	HNDD		FLAGS = 4.	REEL =	1,	FILE		35
39.	HRDD	•	FLAGS = 4.	REEL =	1.	FILE		36
100.	XVPS	٠	FLAGS = 0,	REEL =	1.	FILE		48
101.	HK2PP	٠	[LAG5 = 0.	REEL =	0.	FILE		0
102.	H52F?	•	FLAGS = 0.	REEL =	0,	FILE		0
103,	HK2DD	•	FLAGS = 0.	REEL =	Ο,	FILE		0
104.	HB2CD	:_	FLAGS = 0.	REEL =	0.	FILE	=	0
105.	REENTER	A7	DMAP SEQUENCE		92			
105.	HEED	•	FLAGS = 0.	REEL =	1,	FILE		49
107.	XVPS	• _	FLAGS = 0.	REEL =	1,	FILE	=	50
108,	REENTER	ΔŢ	DMAP SEQUENCE		97			 .
109.	CAAH	•	FLAGS = 0.	REEL =	1.	FILE		51
110,	HEDO		FLAGS = 4.	REEL =	1.	FILE		52
111,	HPDT	•	FLAGS = 4.	REEL =	1,	FILE		52
112,	HTOL	•	FLAGS = 0.	REEL =	1.	FILE	=	53

NASTRAN EXECUTIVE CONTROL DECK ECHO

```
REEL = 1. FILE =
     113, XVPS , FLAGS • O.
     114. REENTER AT DMAP SEQUENCE NUMBER 99
     115.
           HUDVY . FLAGS = 0. REEL = 1. FILE =
           HPNLD , FLAGS ≈ 0,
XVPS , FLAGS ≈ 0,
                                 REEL = 1. FILE =
                                                      56
     116.
                                 REEL = 1. FILE =
                                                      57
     117,
           REENTER AT DWAP SEQUENCE NUMBER 102
     118.
           XVPS , FLAGS = 0.
                                 REEL = 1. FILE =
                                                      58
     119,
                                 REEL = D. FILE =
                                                      0
           HOUDV1 . FLAGS ≈ 0.
     120,
                                 REEL = O. FILE =
                                                       Э
     121.
            HOPNL1 . FLAGS = 0.
            REENTER AT DMAP SEQUENCE NUMBER 118
     122,
            HUPV , FLAGS = 0. REEL = 1. FILE =
     123.
                                 REEL = 1. FILE =
     124.
            XVPS
                . FLAGS = O.
            REENTER AT DMAP SEQUENCE NUMBER 123
     125,
           HOUPV2 , FLAG5 = 0.
                                 REEL = 1, FILE =
     126,
    `^ 127.
                  . FLAGS = 0.
                                            FILE =
           XVPS
                                 REEL = 1,
                  , FLAGS = 0.
                                 REEL ≈ O.
                                            FILE =
                                                      0
     128.
           HOPP2
                 . FLAGS = 0.
                                 REEL = O. FILE =
                                                       0
     129. HCGP2
                  . FLAGS ≈ O.
                                 REEL = O. FILE =
                                                       0
     130. HOES2
                                 REEL = O. FILE =
                      FLAG5 ≈ D.
     131, HOEF2
$ END OF CHECKPOINT DICTIONARY
CEND
```

PAGE

```
CARD
COUNT
1
 2
      3
                NON-LINEAR TRANSIENT PROBLEM
 6
      T ! T ! 6 =
                INPUT DATA OBTAINED FROM RESTART TAPE OF PROBLEM NINE
 7
      SUBTITLE=
      S SPECIFY 51 LINES OF DATA PER PAGE (DOES NOT INCLUDE HEADINGS AT TOP OF PAGE)
10
11
       INE=E1
12
       S RECUEST SORTED AND UNSORTED OUTPUT
13
       S IF THIS CARD IS OMITTED. ONLY THE SORTED BULK DATA WILL APPEAR
1.4
15
: 6
      ECHO-BOTH
17
      & SELECT THE MPC AND LOAD SETS TO BE USED IN THIS SOLUTION
18
      S NOTE THAT NO SPC SET IS SELECTED, AND THAT DLOAD HAS REPLACED LOAD.
19
20
21
      MPC=200
22
       DLOAD=300
23
24
       4 SELECT THE TEMPERATURE SET WHICH IS AN ESTIMATE OF THE FINAL SOLUTION VECTOR
       S THE SELECTION OF THIS SET IS OPTIONAL FOR SOL 9. BUT SHOULD BE MADE IF
25
26
       is the final temperature is several hundred degrees different from the
      S IC VECTOR, AND RADIATIVE INTERCHANGES ARE INCLUDED.
27
38
29
      TEMP(MATERIAL)=400
       5 SELECT THE STEP SIZE, NUMBER OF INCREMENTS, AND PRINTOUT FREQUENCY
31
32
33
       TSTEP=500
34
35
       S SELECT THE TEMPERATURE SET DEFINING THE TEMPERATURE VECTOR AT T=0.
36
37
       IC=600
ઉછ
       S SELECT OUTPUT DESIRED
33
41
       CUTPUT
42
       S DEFINE A GROUP OF GRID POINTS TO BE REFERENCED BY AN OUTPUT REQUEST
13
11
45
       SET 5 = 1,2,3,4,5,6,7,8,100
46
47
       THERMAL=5
48
       49
       50
```

NON-LINEAR TRANSIENT PROBLEM
INPUT DATA OBTAINED FROM RESTART TAPE OF PROBLEM NINE

JANUARY 6, 1976 NASTRAN 12/31/74 PAGE

6

CASE CONTROL DECK' ECHO

CARD COUNT

52 53

53 BEGIN BULK

INPUT DATA OBTAINED FROM RESTART TAPE OF PROBLEM NINE

1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 . - T. 1 ・・ト・コストマンティートミ ・コカーをボルボテルオ トール・オリアネスティアトアコフス オスタントライス オスタンティート ディー・カー・ファン \$ PROBLEM 10 IS BEING RUN USING A RESTART TAPE MADE BY PROBLEM NINE. S NOTE THE ALTER IN THE EXECUTIVE CONTROL WHICH WAS ADDED TO S CORRECT A RESTART TABLE ERROR COMMON TO ALL TRANSIENT HEAT TRANSFER RESTARTS

INPUT BULK DATA DECK ECHO

\$ THE CONDUCTIVITY OF MAT4 CARD 1000 IS BEING ALTERED TO DEMONSTRATE \$ THAT THE BULK DATA CAN BE MODIFIED DURING A RESTART. S IF NO MODIFICATIONS TO THE BULK DATA WERE DESIRED. THE 'BEGIN BULK' S CARD WOULD BE IMMEDIATELY FOLLOWED BY THE 'ENDDATA' CARD.

\$ THE '/' CARD IS USED TO REMOVE THE OLD MAT4 CARD 1000 FROM THE BULK 3 DATA TO AVOID DUPLICATE INPUT.

2.426+6

26 S THE NEW MAT4 CARD FOLLOWS

MAT4 1000 250.

S ENDDATA

TOTAL COUNT= 24

S

COUNT 1: CELASE 300 1.+5 1C0 1 1: CELASE 300 1.+5 1C0 1 3- +CONVEC 3- +CONVEC 3- +CONVEC 3- +CONVEC 4- CHEBY 200 2000 AREA4 1 2 6 6 5 6- C.495Y 400 2000 AREA4 2 3 7 6 6- C.495Y 400 2000 AREA4 5 6 2 1 8- CHBBY 7C0 200 2000 AREA4 5 6 2 1 8- CHBBY 7C0 200 2000 AREA4 6 7 3 2 2 9- CHBBY 7C0 2000 AREA4 6 7 3 2 2 9- CHBBY 7C0 2000 AREA4 6 7 3 2 2 9- CHBBY 7C0 2000 AREA4 7 8 4 3 3 11- COVAD2 30 2C0 1 2 6 5 5 11- COVAD2 30 2C0 1 2 6 5 5 11- COVAD2 50 200 3 AREA4 6 7 7 3 2 2 11- COVAD2 50 200 3 AREA4 6 7 7 8 4 3 3 11- COVAD2 50 200 3 AREA4 6 7 7 8 7 6 112- COVAD2 50 200 3 4 8 8 7 7 8 113- GRID 1 0.0 0.0 0.0 0.0 18 15- GRID 2 1.1 0.0 0.0 0.0 18 15- GRID 2 1.1 0.0 0.0 0.0 18 15- GRID 2 1.1 0.0 0.0 0.0 18 15- GRID 3 .2 0.0 0.0 0.0 18 15- GRID 4 .3 0.0 0.0 0.0 0.0 18 15- GRID 5 .0 0.0 1.1 0.0 0.0 0.0 18 15- GRID 6 .1 1.1 0.0 0.0 0.0 0.0 18 15- GRID 7 .2 1.1 0.0 0.0 0.0 0.0 0.0 18 15- GRID 8 .0 0.0 1.1 0.0 0.0 0.0 0.0 0.0 0.0 0.0			. s c	RTED	ви	LK D	АТА	E C H O		
1: CELASZ 300 1.+5 100 1 2: CHBOY 60 300 1.18 1 5		_	_		_	_		_		_
2- CH8DY 60 300 LINE 1 5 +CONVEC 3- +CONVEC 100 100 4- CH8DY 200 2000 AREA4 5- CH8DY 300 2000 AREA4 5- CH8DY 300 2000 AREA4 6- CH8DY 500 2000 AREA4 7- CH8DY 600 2000 AREA4 8- CH8DY 600 2000 AREA4 9- CH8DY 700 2000 AREA4 6- CH8DY 600 2000 AREA4 9- CH8DY 700 2000 AREA4 6- CH8DY 600 AREA4 6- CH8DY 600 2000 AREA4 6- CH8DY 600 AREA48 6- CH8DY 600 AREA48 6- CH8DY 600 AREA48 6- CH8DY 600 AREA48 6- CH8DY						е	5 7	8	• •	9 10 .
3- +CONVEC 100 100 4- CHEGY 200 2000 AREA4 1 2 6 5 5- CHEGY 200 2000 AREA4 2 3 7 6 6- CHEGY 500 2000 AREA4 2 3 7 6 7- CHEGY 500 2000 AREA4 5 6 2 1 8- CHEGY 700 2000 AREA4 5 6 2 1 9- CHEGY 700 2000 AREA4 7 8 4 3 2 9- CHEGY 700 2000 AREA4 7 8 4 3 3 10- COULD 200 2000 AREA4 7 8 4 3 3 11- COULD 200 200 AREA4 7 8 4 3 3 11- COULD 200 200 200 AREA4 7 8 7 6 112- COULD 200 200 3 4 8 7 7 6 112- COULD 200 200 3 4 8 7 7 6 113- CROS 10 100 10 2 114- CROS 20 100 9 6 7 6 15- GRID 1 0 0.0 0.0 0.0 10 16- GRID 2 1 0.0 0.0 0.0 0.0 10 16- GRID 3 2 0.0 0.0 0.0 0.0 11 18- CRID 1 0 0.0 0.0 0.0 0.0 11 18- CRID 3 2 0.0 0.0 0.0 0.0 11 18- CRID 3 2 0.0 0.0 0.0 0.0 0.0 11 18- CRID 3 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0						_				
4- CHEGY 200 2000 AREA4 1 2 6 5 5- CHEGY 300 2000 AREA4 2 3 7 6 6- CHEGY 400 2000 AREA4 3 4 8 7 7- CHEGY 500 2000 AREA4 6 7 3 2 8- CHEGY 700 2000 AREA4 6 7 3 2 9- CHEGY 700 2000 AREA4 6 7 3 2 10- CQUAD2 30 200 1 2 3 7 6 11- CQUAD2 30 200 1 2 6 5 11- CQUAD2 40 200 2 3 7 6 11- CQUAD2 50 200 3 4 8 7 1 11- CQUAD2 50 200 3 4 8 7 1 11- CQUAD2 50 200 100 10 2 11- CQUAD2 50 200 3 4 8 7 1 11- CQUAD2 50 200 100 10 2 11- CQUAD2 50 200 100 9 6 1 11- CQUAD2 50 200 100 10 2 11- CQUAD2 50 200 100 9 6 1 12- CQUAD2 50 200 100 9 6 1 13- CRID 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				LINE	1	5				+CONVEC
5-						•	•	_		
6- CHSDY 500 2000 AFEA4 3 4 8 7 7- CHBDY 500 2000 AREA4 5 6 2 1 8- CHBDY 650 2000 AREA4 6 7 3 2 9- CHBDY 700 2000 AREA4 6 7 3 2 10- COUAD2 30 200 1 2 6 5 11- COUAD2 30 200 1 2 6 5 11- COUAD2 50 200 3 4 8 7 13- CROC 10 10 10 10 2 14- CROC 20 10 10 10 0 2 14- CROC 10 10 10 10 0 2 15- GRID 1 1 0.0 0.0 0.0 15- GRID 1 1 0.0 0.0 0.0 16- GRID 2 1 1 0.0 0.0 0.0 17- GRID 3 .2 0.0 0.0 18- GRID 4 .3 0.0 0.0 0.0 19- GRID 5 0.0 .1 0.0 21- GRID 6 .1 1 1 0.0 22- GRID 8 .3 1 0.0 0.0 23- GRID 8 .3 1 0.0 0.0 24- GRID 8 .3 1 1 0.0 0.0 25- GRID 100 2.0 .0 0.0 0.0 25- GRID 100 0.0 0.0 0.0 0.0 0.0 25- GRID 100 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0								5		
7- ChBDY 500 2060 AREA4 5 6 2 1 8- ChBDY 500 2000 AREA4 7 8 4 3 9- CHBDY 700 2000 AREA4 7 8 4 3 10- CQUAD2 30 2C0 1 2 2 6 5 11- CQUAD2 30 2C0 1 2 3 7 6 6 11- CQUAD2 40 200 2 3 7 6 6 11- CQUAD2 50 200 3 4 8 7 113- CROC 10 100 10 2 14- CROD 20 100 9 6 15- GRID 1 0.0 0.0 0.0 0.0 16- GRID 2 1 0.0 9 6 17- GRID 3 .2 0.0 0.0 0.0 18- GRID 4 .3 0.0 0.0 0.0 18- GRID 5 0.0 1 1 0.0 0.0 20- GRID 6 1 1 1 0.0 0.0 21- GRID 6 1 1 1 0.0 0.0 22- GRID 8 3 1 0.0 23- GRID 8 3 1 0.0 0.0 24- GRID 8 3 1 0.0 0.0 25- GRID 100 2 0.0 0.0 0.0 25- GRID 100 2 0.0 0.0 0.0 25- GRID 100 2.0 0.0 0.0 0.0 0.0 25- GRID 100 0.0 0.0 0.0 0.0 0.0 25- GRID 100 0.0 0.0 0.0 0.0 0.0 0.0 25- GRID 100 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0										
8- CHBDY 6CO 2COO AREA4 6 7 3 3 2 9- CHBDY 7CO 2COO AREA4 7 8 4 3 10- CQUAD2 30 2CO 1 2 2 6 5 11- CQUAD2 30 2CO 1 2 6 5 11- CQUAD2 40 200 2 3 7 6 112- CQUAD2 50 200 3 4 8 7 13- CROC 10 100 10 2 14- CROC 20 100 9 6 15- GRID 1 0.0 0.0 0.0 15- GRID 1 0.0 0.0 0.0 17- GRID 3 .2 0.0 0.0 18- GRID 4 .3 0.0 0.0 19- GRID 5 0.0 11 0.0 20- GRID 6 .1 1 0.0 21- GRID 5 0.0 11 0.0 21- GRID 7 .2 11 0.0 21- GRID 7 .2 11 0.0 22- GRID 8 .3 1 0.0 23- GRID 9 0.0 .2 0.0 23- GRID 9 0.0 .2 0.0 24- GRID 10 0.0 0.0 1 0.0 25- GRID 100 20.0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1										
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TEMPD 600

TLCAD2 300

+TL1 0.

TSTEP 500

ENDDATA

CARD

COUNT 52-

53 -

54-

55 -

55 -

JANUARY 6, 1976 NASTRAN 12/31/74 PAGE

9

SORTED BULK DATA ECHO . 1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 TEMPD 400 300. 300. 0.0 1.+6 0.0 0.0 +TL1 300 Ο. 45 30. 1

NON-LINEAR TRANSIERT PROBLEM INPUT DATA OBTAINED FROM RESTART TAPE OF PROBLEM NINE	JANUARY	6, 1976	NASTRAN	12/31,
LIST OF MODIFIED CARDS				
MASK WORD - BIT POSITION - CARD NAME - PACKED BIT POSITION				
2				
4				
5				

NASTRAN SOURCE PROGRAM COMPILATION DMAP-DMAP INSTRUCTION

	NO.	DWAP INS	MCC 110N
*	1	BEGIN	HEAT NO.9 TRANSIENT HEAT TRANSFER ANALYSIS \$
*	2	FILE	KGGX=TAPE/ KGG=TAPE \$
	3	GP1	GEOM1, GEOM2, /HGPL, HEQEXIN, HGPDT, HCSTM, HBGPDT, HSIL/V, N, HLUSET/V, N, HALWAYS=-1/V, N, HNOGPDT S
	4	SAVE	HLUSET.HNOGPDT\$
	5	PURGE	HUSET, HGM, HGO, HKAA, HBAA, HPSO, HKFS, HQP, HEST/HNOGPDT \$
	6	CHKPNT	HGPL, HEQEXIN, HGPDT, HCSTM, HBGPDT, HSIL, HUSET, HGM, HGO, HKAA, HBAA, HPSO, HKFS, HQP, HEST \$
	7	COND	HLBL5,HN0CP0T\$
	8	G22	GECM2.HEQEXIN/HECT \$
	9	CHKE:11	HECT S
	10	PLTSET	PCCB. MEGEXIN. HECT/HPLTSETX, HPLTPAR, HGPSETS, HELSETS/V, N, HNSIL/V, N, GUTFPLOT &
	11	SAVE	HNS11.JUMPPLOT \$
	12	PRTMSG	HPLTSETX//S
	13	SETVAL	//V.M.HPLTFLG/C.N.1/V.N.HPFILE/C,N.0 \$
	14	SAVE	HPLTFLG, HPFILE \$
	15	COND	HP1, JUSPPLOTS
	13	PLOT	HPLTPAR, HGPSETS, HELSETS, CASECC, HBGPDT, HEQEXIN, HSIL, ./HPLOTX1/ V, N, HNSIL/V, N, HLUSET/V, N, JUMPPLOT/V, N, HPLTFLG/V, N, HPFILE \$
	17	SAVE	JUMPPLOT.HPLTFLG.HPFILE \$
	13	PRTMSG	HPLOTX1//\$
	19	LABEL	HP1 S
	2:0	CHKENT	HPLTPAR.HGPSETS.HELSETS \$
	21	GP3	GECM3. PEDEXIN, GECM2/HSLT. HGPTT/C.N. 123/C.N. 123/C.N. 123 \$
	22	CHKPNT	HGPTY HSLY S
	23	TA1.	.HECT.EPT H839PDT.HSIL.HGPTT.HCSTM/HESTHGEI.HECPT.HGPCT/ V.N.

JANUARY

NASTRAN SOURCE PROGRAM COMPILATION DMAP-DMAP INSTRUCTION

NO.

HLUSET/C.N. 123/V.N. HNOS1MP=-1/C.N. 0/C.N. 123/C.N. 123 \$

- 24 SAVE HNOSIMP \$
- 25 CHKPNT HEST. HECPT. HGPCT \$
- 26 COND HLBL: HNOSIMP\$
- * 27 SMA1 HCSTM.MPT.HECPT.HGPCT.DIT/HKGGX.,HGPST/C.N.123/V.N.
- * 28 SAVE HNNIK \$
 - 29 CHKPNT HKGGX, HGPST \$
- * 30 SMA2 HCSTM.MPT.HECPT.HGPCT.DIT/.HBGG/C.N.1.0/C.N.123/V.N. HNOBGG=
- * 31 SAVE HNOSGG \$
- * 32 PURGE HSNN.HBFF.HBAA,HBGG/HNOBGG\$
 - 33 CHKPNT HBGG HBNN HEFF HBAA \$
- * 34 LABEL HIBL'S
- 35 RMG HEST, MATPOOL.HGPTT.HKGGX/HRGG,HQGE,HKGG/C,Y,TABS/C,Y,SIGMA=0.0/ V,N,HNLR/V,N,HLUSET \$
- * 36 SAVE ' HNLR S
- * 37 EQUIV HKGGX, HKGG/HNLR \$
- * 38 PURGE HRGG.HRNN.HRFF.HRAA.HRDD/HNLR \$
 - 39 CHKPNT HRGG, HRNN, HRFF, HRAA, HRDD, HKGG, HQGE \$
 - 40 GP4 CASECC.GEOM4.HEOEXIN.HSIL.HGPDT/HRG..HUSET./V.N.HLUSET/V.N.
 HMPCF1=-1/V.N.HMPCF2=-1/V.N.HSINGLE=-1/V.N.HOMIT=-1/V.N.HREACT=
 -1/C.N.G/C.N.123/V.N.HNOSET=-1/V.N.HNOL/V.N.HNOA=-1 \$
 - 41 SAVE HMPCF .HSINGLE.HOWIT.HNOSET.HREACT.HMPCF2.HNOL.HNOA \$
 - 42 PURGE HGM.HGMD/HMPCF1/HGO.HGOD/HOMIT/HKFS.HPSO.HQP/HSINGLE \$
- * 43 EQUIV HKGG.HENN/HMPCF1/HRGG.HRNN/HMPCF1/HBGG.HBNN/HMPCF1 S
 - 44 CHKPNT HGM, HRG, HGG, HKFS, HQP, HGSET, HGMD, HGOD, HPSO, HKNN, HRNN, HBNN \$
- * 45 COND HLEL2, HNOSIMP \$

NASTRAN SOURCE PROGRAM COMP'I LAT'I ON DMAP-DMAP INSTRUCTION NO.

- * 46 GPSP HGPL. MGPST. HUSET, HSIL/HOGPST \$
- * 47 OFP HOGPST....//V.N.HCARDNO \$
- 48 SAVE HCARONO S
- * 49 LABEL HLBL2 \$
- * 50 COND HLBL3.HMPCF: \$
 - 51 MCE1 HUSET, HRG/HCM \$
 - 52 CHKENT HGM S
- * 53 MCEC HUSET.HOM.HKGG.HRGG.HBGG./HKNN.HRNN.HBNN. \$
 - 54 CHKTAT HKNN, HRNN, HENN \$
- * 55 LABEL HLBLG \$
- * 56 EQUIV HKNN HKFF, HSINGLE/HRNN, HRFF/HSINGLE/HENN, HBFF/HSINGLE \$
 - 57 CHKPNT HKFF, HRFF, HRFF S
- * 58 COND HUBL4.HSINGLE \$
- * 59 SCE1 HUSET.HKNN.HENN.HBNN./HKFF.HKFS.,HRFF.HBFF. \$
 - 60 CHKENT HKES, HKEE, HREE, HEEF \$
- * 61 LABEL HEBL4 \$
- * 62 EQUIV HKFF.HK4A/H6MIT/H8FF.HRAA/H6MIT/H8FF.HBAA/H6MIT \$
 - 63 CHKPNT HKA4, HR4A, H84A \$
- * 64 COND HLBLS.HOMIT \$
- * 65 SMP1 HUSET HKFF.../HGC.HKAA...... \$
 - 66 CHKPNT HGO, HKAA S
- * 67 COND HEBER HNER S
- * 63 SMP2 HUSET HGO, HRFF/HRAA \$
 - 69 CHKPNT HRAA 5
- * 70 LABEL HEELR S
- * 71 COND HLBLS.HNDEGG \$

JANUARY

NASTRAN SOURCE PROGRAM COMPILATION DMAP-DMAP INSTRUCTION

- * 72 SMP2 HUSET.HGO.HBFF/HBAA \$
 - 73 CHKPNT HBAA 1
- * 74 LABEL HLBL5 \$
 - 75 DPD DYNAMICS.HGPL,HSIL.HUSET/HGPLD,HSILD.HUSETD,HTFPOOL,HDLT,...
 HNLFT.HTRL..HEQDYN/V.N.HLUSET/V.N.HLUSETD/C.N.123 /V.N.HNODLT/
 C.N.123/C.N.123/V.N.HNONLFT/V.N.HNOTPL/C.N.123/C.N.123/ V.N.
 HNOUE \$
 - 76 "SAVE HLUSETD. HNODLT, HNONLFT, HNOTEL, HNOUE \$
 - 77 COND HERRORI, HNCTRLS
 - 78 EQUIV HGO, HGOD/HMGUE/HGM, HGMD/HMOUE \$
 - '79 BURGE HPPO, HPSO, HPDO, HPDT/HNODLT \$
 - 80 CHKPNT HUSETD.HEQDYN.HTFPOOL.HDLT.HTRL.HGOD.HGMD.HNLFT.HSILD.HGPLD.
 - 81 MTRXIN CASECC.MATPOOL.HEQDYN.HTFPOOL/HK2PP.H52PP/V.N.HLUSETD/ V.N. HNOK2FP/C.N.123/V.N.HNOB2PP \$
 - 82 SAVE HNOK2PP, HNOB2PP \$
 - 83 PARAM //C.N.AND/V.N.HKDEKA/V.N.HNQUE/V.N.HNOK2PP \$
- * 84 PURGE HK2DD/HN0K2PP/HB2DD/HN0B2PP \$
- * 85 EQUIV HKAA, HKDD/HKDEKA/HB2PP, HB2DD/HNOA/HK2PP, HK2DD/HNOA/HRAA, HRDD/ HNOUE \$
 - 86 CHKPNT HK2PP, H82PP, HK2DD, HB2DD, HKDC, HRDD \$
- 87 COND HEBLE, HNOGPDT \$
- * 88 GKAD HUSETD.HGM.HGO.HKAA.HBAA.HKAA.HK2PP.HB2PP/HXDD.HBDD.HRDD.HGDD.HGDD.HK2DD.HM2DD.HB2DD/C.N.TRANRESP/C.N.DISP/C.N.DIRECT/C.Y.HG=0.0/C.Y.HW3=0.0/C.Y.HW4=0.0/V.N.HNGK2PP/C.N.-1/V.N.HNGB2PP/V.E.HM9ECT/V.N.HSINGLE/V.N.HOMIT/V.N.HNOUE/C.N.-1/V.N.HNGB3G/V.N.HNOSIMP/C.N.-1 \$
- 89 LABEL HLBL6 \$
- # 90 EOULV HK2DD.HKDD/HNOSIMP/HB2DD.HBDD/HNOGPDT \$
 - 91 CHKPNT HKDD.HEDD.HRDD.HGMD.HGCD \$
- 92 TRLG CASECC.HUSETD.HDLT.HSLT.HBGPDT.HSLL.HCSTM.HTRL.DIT.HGMD.HGOD..

15

NASTRAN SOURCE PROGRAM COMPILATION DMAP-DMAP INSTRUCTION NO. HEST/HPPO.HPSO.HPDO.HPDT., HTOL/V.N.HNOSET/V.N.HPDEPDO \$ * 93 SAVË HPDEPtO, HNOSET \$ * 94 EOUIV HPPO, HPDO/HNOSET \$ * 95 EQUIV HPDO: HPDT/HPDEPDO \$ 93 CHKPNT HPPO. HPDC, HPSO, HTCL, HPDT \$ * 9" TRHT CASECC. HUSETD. HNLFT. DIT. HGPTT, HKDD, HBDD. HRDD, HPDT. HTRL/HUDVT. HPNLD/C.Y.EETA=.55/C.Y.TABS=0.0/V.N.HNLR/C.Y.RADLIN=-1 \$ 93 CHKPNT HUDVT.HPNLD \$ CASECC, HEODYN, HUSETD, HUDVT, HTOL, XYCDB, HPNLD/HOUDV1, HOPNL1/ C. * 99 VDR N.TRANRESP/C.N.DIRECT/C.N.O/V.N.HNOD/V.N.HNOP/C.N.O \$ * 100 SAVE HNOD HNOP \$ 10: CHKPNT HOUDWI, HOPNET \$ 102 COND HLBL7, HNOD \$ 103 SDR3 HOUDY', HOPNL1..., HOUDV2.HOPNL2..., \$ 104 OFP HOUDY2, HOPPIL2, ... //V.N. HCARDNO \$ 105 SAVE HCARDNO \$ 106 CHKPNT HOPNIZ, HOUDV2 \$ 110 LABEL HLEL7 \$ 1 111 PARAM * TOLIGONAL OF TOLIGONAL OF THE TOLIGONA * 112 COND HEBES.HPUUNP \$ * 113 EQUIV HUDVI HUPV/HNOA \$ * 114 COND HLELS HNO2 S * 115 SDR1 HUSE(D., HUD)/T.,, HGOD, HGMD, HPSO, HKFS, ./HUPV, .HQP/C.N, 1/C.N, TRANSMI \$ * 116 LABEL HLBL8 \$ 117 CHKPNT HUPV.HOP S * 119 PLTTRAN HBGPDT.HSTL/HBGPDP.HSTP/V.N.HLUSET/V.N.HLUSEP \$

'NASTRAN SOURCE PROGRAM COMPILATION DMAP - DMAP INSTRUCTION NO.

- * 119 SAVE HLUSEP S
- * 120 5082 CASECC. HCCTM. MPT. DIT. HEODYN, HSILD., HTOL, HBGPDP, HPPO, HOP, HUPV. HEST XYCDB/HOPP1 HOOP1 HOUPV1 HOES1 HOEF1 HPUGV /C.N.

TRANRESP \$

- * 121 SDR3 HOPP: HOOP1 HOURY1.HOES1 HOEE1./HOPP2.HOOP2.HOUP/2 HOES2. HOEE2 S
 - 122 CHKPNT HOPP2.HOOP2.HOUPV2.HOES2.HOEF2 \$
- * 123 OFP HOPP2.HOOP2.HOUPV2.HOEF2.HOES2.//V.N.HCARDNO \$
- * 124 SAVE HCARDNO \$
- * 125 COND HP2.JUMPPLOT \$
- HPLTPAR, HGPSETS, HELSETS, CASECC, HBGPDT, HEQEXIN, HSIP, HPUGV/ * 126 PLOT HPLOTX2/V, N, HNSIL/V, N, HLUSEP/V, N, JUMPPLOT/V, N, HPLTFLG/V, N, HPFILE \$
- * 127 SAVE HPFILE S
- * 12B PRIMSG HPLOTX2// \$
- * 129 LAREL HP2 S
- * 130 XYTRAN XYCDB. HOPP2. HOUPV2. HOES2. HOEF2/HXYPLTT/C.N. TRAN/C.N. PSET/ V.N.HPFILE/V.N.HCARDNO \$
- * 131 SAVE HPFILE. HCARDNO \$
- * 132 XYPLOT HXYPLTT// \$
- * 133 LABEL HLBL9 \$
- * 134 JUMP FINIS \$
- * 135 LABEL HERRORI S
- * 136 PRTPARM //C.N -1/C.N.HDIRTRD\$
- * 137 LABEL FINISS
- * 133 END \$
- *** USER WARNING MESSAGE 54. PARAMETER NAMED EPSHT NOT REFERENCED
- *** USER WARNING MESSAGE 54. PARAMETER NAMED MAXIT NOT REFERENCED
 - *INDICATES INSTRUCTIONS TO BE EXECUTED FOR MODIFIED RESTART

THE FOLLOWING FILES WERE USED FROM OLD PROBLEM TAPE TO INITIATE RESTART

FILE NAME REEL NO. FILE NO.

HCSTM HPLTPAR HGPSETS HELSETS HNLFT HX2PP	(PUPGED) (PURGED) (PURGED) (PUPGED)	
HE2PP	(PURGED)	_
HGPL	. 1	6
HEDEXIN	1	7
HEGPOT	1	9
HSIL	1	10
HGPTT	1	15
HSLT	1	16
HEST	1	18
HECPT	1	19
HGPCT	1	20
HUSET.	1	31
HGM N	1	33
HGMD	1	33
HUSETD	1	41
HEODYN	1	42
HDLT	1	43
HTRL	1	44
HSILD	1	45
XVPS	1	62
A V . J	•	0.2

NO ERRORS FOUND - EXECUTE NASTRAN PROGRAM

*** USER INFORMATION MESSAGE | FULL INTERNAL SPACE NODE AVAILABLE |

*** USIR INFORMATION MESSAGE . 6 ELEMENTS HAVE A TOTAL VIEW FACTOR (FA/A) LESS THAN 0.99

*** USER INFORMATION MESSAGE 3023. C = 0 ₹ = 2

*** USER INFORMATION MESSAGE 3027, SYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

*** USER INFORMATION MESSAGE 3028. B = 5 BEAR = 5 CEAR = 1

POINT-ID = 1

TOUC	TVDE	MAI 115
T [ME	TYPE	VALUE
0.0 3.000000E 01	s s	3.000000E 02 2.994612E 02
	3	
6.000000E 01	5	2.9585725 02
9.000000E 01	5	2.935396E 02
1.200000E 02	5	2.914375E 02
1.500000E 02	5	2.895293E 02
1.800000E 02	5	2.8780405 02
2.100000E 02 2.400000E 02	5	2.862502E 02
	5	2.840562E 02
2.700000E 02	5	2.835086E 02
3.000000E 02	5	2.824949E 02
3.300000E 02	5	2 815017E 02
3.500000E 02	5	2.806172E 02 2.798301E 02
3.900000E 02 4.200000E 02	5	
	5	
	5	
	5	2.779543E 02 2.774624E 02
	5	
5.400000E 02 5.700000E 02	5	2.770251E 02 2.766365E 02
	2	2.762910E 02
	5	2.759839E 02
6.300000E 02 6.600000E 02	5	2.759839E 02 2.757109E 02
6.900000E 02	5	2.757109E 02 2.754683E 02
7.200000E 02	5	2.752524£ 02
7.500000E 02	3	2.752524E 02 2.750603E 02
7.800000E 02	3	2.743896E 02
8.10000GE 02	9	2.747375E 02
8.400000E 02	5	2.747373E 02 2.746025E 02
8.700000E 02	5	2.744522E 02
9.000000E 02	5	2.743752E 02
9.300000E 02		2.742E00E 02
9.600000E 02	5	2.741951E 02
9.900000E 02	Š	2.741331E 02 2.741196E 02
1.020000E 02		2.740525E 02
1.050000E 03	3	2.7399278 02
1.080000E 03	5	2.739397E 02 2.739395E 02
1.110000E 03	5	2.738395E 02 2.738321E 02
1.140000E 03	5	2.738321E 02 2.738499E 02
1.170000E 03	9	2.738123E 02
1.20JOOCE 03	. 9	2.737786E 02
1.230000E 03	Š	2.737490E 02
1.260000E 03	S	2.737490E 02 2.737227E 02
1.290000E 03	Š	2.737227E 02 2.736990E 02
1.320000E 03	Š	2.7367805 02
1.3500000 03	Š	2.736594E 02
1.350000 03	3	2.730054E 02

POINT-ID =	2	
TIME 0.0 3.00000CE 01 6.00000E 01 9.0000CE 01 1.200000E 02 1.5000C0E 02 2.16000CE 02 2.100000E 02 2.40000E 02 2.3000CE 02 3.30000CE 02 3.30000CE 02 3.50000E 02 4.50000E 02 4.50000E 02 4.50000E 02 4.50000E 02 4.50000E 02 6.50000E 02 6.70000E 02 6.7000CE 02 6.7000CE 02 6.7000CE 02 6.7000CE 02 6.7000CE 02 6.9000CE 02 7.5000CE 02 6.900CE 02 7.5000CE 02 7.5000CE 02 7.5000CE 02 7.5000CE 02 7.5000CE 02 7.500CE 03 1.000CE 03 1.100CE 03 1.110CE 03 1.110CE 03 1.110CE 03 1.250CE 03 1.250CE 03 1.250CE 03 1.250CE 03	E P S S S S S S S S S S S S S S S S S S S	VALUE 3 GC0000E 02 2.575757E 02 2.527366E 02 2.527366E 02 2.52436E 02 2.524435E 02 2.775692E 02 2.775692E 02 2.772375E 02 2.539543E 02 2.645061E 02 2.645061E 02 2.645061E 02 2.65790E 02 2.57790E 02 2.55790E 02 2.557952E 02 2.557956E 02 2.527956E 02 2.527956E 02 2.5279574E 02 2.527974E 02

POINT-ID = 3

TIME	TYPE	VALUE	
0.0	s	3.00000E	02
3.0000002 0	1 5	2.9-3074E	02
6.000000E 0	1 5	2.850273E	02
9.000000E 0	1 5	2.773352E	02
1.200000E 0	2 6	2.707915E	02
1.500000E 0	2 3	2.651521E	02
	2 5		02
1.800000E 0	2 5	2.602544E	
2.100000E 0	2 5	2.559797E	02
2.400000E 0	2 5	2.522339E	02
2.700000E 0	2 5	2.469420E	02
3.000000E 0	2 S	2.460420	02
3.300000E 0	2 S	2.434824E 2.412198E	02
3.600000E C	2 S	2.412198E	02
3.900000E 0	2 S	2.392171E 2.371427E	02
4.200000E 0	2 S	2.371427E	02
4.500000E 0	2 S	2.3556938	02
4.800000E 0	2 S	2.344729E	02
5.100000E 0	2 S	2.332330E	02
5.400000E 0	2 S	2.321317E	02
5.700000E 0	2 S	2.311530E	02
6.000000E 0	2 5	2.302828E	02
6.300000E 0	2 5	2.295091E	02
6.600000E 0	2 5	2.288210E	02
6.900000E 0	2 5	2.288210E 2.282089E	02
7.200000E 0	2 5	2.276643E	02
7.500000E 0	2 3	2.271797E	02
7.800000E 0	2 3	2.267484E	02
8.100000E 0	2 3	2.263646E	02
	2 S	2.260229E	02
	π 5		
	2 S	2.257187E 2.257479E	02
	2 5	2.254479E	02
	2 S	2.252069E	02
	2 S	2.249923E	02
	2 S	2.248011E	02
	3 S	2.246311E	02
	3 S	2.244796E	02
	3 5	2.243447E	02
1.110000E 0	3 S	2.242246E	02
1.1400COE C	3 S	2.241177E	02
1.170000E C	3 S	2.240224E	02
1.200000E 0	1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2.239376E 2.238621E	02
1.230000E 0	3 S	2.238621E	02
	3 S	2.237948E	02
	3 \$	2.237349E	02
	3 5	2.236815E	02
	3 S	2.236340E	02
	-	2.2000706	-

POINT-ID = 4

T 145		
TIME	TYPE	VALUE
0.0	5	3.000000E 02
3.000000E 01	S	2.900912E 02
6.0000005 01	S	2,8195408 02
9.000000E 01	s	2.7%0925E 02
1.2000008 92	S	2.675840E 02
1.500000E 02	S	2.61:379E 02
1.600005E 00	S	2.505765E 02
2.100000E 62	S	2.505765E 02 2.507526E 02
2.4000005 02	S	2.460191E 62
2.700000E 02	******	2.4257118 02
3.000000E 02	S	0 0 0000 00
3.3000005 02	S	2 3580025 02
0.800000E 02	S	2.2421275 02
3.9000008 02	S	2.324768E C2
4.2000006 02	5	2 3111858 02
4.50000000 02	Š	2.280777E 02
4.800000E 02	Š	2.320768E C2 2.011185E 02 2.280777E 02 2.260364E 02
5.1000000E 02	5555555	2.3 16423E 02 2.384000E 02 2.340.77E 02 2.320.768E 02 2.320777E 02 2.280777E 02 2.28084E 02 2.28088E 02
5.400000E 02	3	2.234383E 02 2.240533E 02
5.7000GGE 02	3	2.231738E 02
6.000000E 02	2	2.231738E 02 2.222140E 02 2.213506E 02 2.213506E 02
6.300000E 02	5	2.222140E 02
	2	2:213306E 02 2:30016E 02
	5	2 200 68 02
6.900000E 02	999999999	2.222140E 02 2.21336E 02 2.10016E 02 2.10026E 02 2.10026E 02 2.167938 02 2.187938 02 2.187938 02 2.178913E 02 2.178914 02 2.1777845 02 2.184784E 02 2.164784E 02
7.200000E 02	5	2.1002858 02
7.50000008 02	5	2.187908E 02
7.900000E 02	S	2.183148E 02
8.1000005 02	S	2.178913E 02
8.400000E 02	S	2.175141E 02 2.171784E 02
8. 7 0000005 02	5	2.171784E G2
9.0000001 02	S	2.165794E 02
9.300000E 02	S	2 1651326 02
9.600000E 02	Ş	2 1837028 02
9.900000E 02	S	2.1818505 02
1.020000E 03	S	2.159774E 02 2.153102E 02 2.153611E 02
1.0500008 03	S	2.153102E 02
1.080000E 03	S	2,150011F 02
1.1100000E 03	s	2 1552588 02
1.1450CDE 03	S	2 154104E 02
1.1700005 03	S	2.153051E 02
1.2000005 03	<i>~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~</i>	2.152115E 02
1.230000E 03	S	2.151280E 02
1.2600005 03	S	2.151280E 02 2.150537E 02 2.149877E 02
1.290000E 03	5 5 5	2.149877E 02
1.3230002 03	Š	2.149286E 02
1.350000E 03	Š	2.1487605 02
	•	

NON-LINEAR TRANSIENT PROBLEM INPUT DATA OBTAINED FROM RESTART TAPE OF PROBLEM NINE

POINT-ID =

TIME	TYPE	VALUE
0.0	s	3.000000E 02
3.000000E 01	Š	2.984612E 02
6.000000E 01	S	2.958572E 02
9.0000GOE 01	S	2.935396E 02
1.200000E 02	S	2.9.4375E 02
1.500000E 02	S	2.805293E 02
1.600000E C2	S	2.878040E 02
2.100000E 02	S	2.8625028 02
2.400000E 02	S	2.8485625 02
2.7000CCE 02	S	2.8360865 02
3.000000E 02	S	2.824949E 02
3.300000E 02	S	2.815017E 02
3.600000E 02	5555555555	2.805172E 02
3.800000E 02	Š	2.798301E 02
4.200000E 02	S	2.791301E 02
4.500000E 02	Š	2.785078E 02
4.800000E 02	S	2.779543E 02
5,100000E 02	Š	2.774624E 02
5.400000E 02	5	2.770251E 02
5.700000E 02	2	2.70036TE 02 2.700365E 02
	3	2.760365E 02 2.762910E 02
	3	
6.300000E 02	S	2.759839E 02
6.600000E 02	\$	2.757109E 02
6.90000E 02	S	2.754683E 02
7,200000E 02	S	2.752524E 02
7.500000E 02	S	2.750603E 02
7.800000E 02	S	2.748898E 02
8.100000E 02	S	2.747375E 02
8.4000CCE 02	S	2.746025E 02
8.700000E 02	S	2.744822E 02
9.0000COE 02	S	2.743752E 02
9.300000E 02	S	2.742800E 02
9.600000E 02	S	2.741951E 02
9.9000COE 02	S	2.741196E 02
1.020000E 03	S	2.740525E C2
1.050000E 03	Š	2.739927E 02
1.0800COE G3	5	2.739395E 02
1.1100COE 03	Š	2.738921E 02
1.140000E 03	č	2.7384998 02
1.170000E 03		2.738433E 02
1.2000002 03	9	2.737788E 02
	3	2.737788E 02 2.737490E 02
	5	
1.260000E 03	5	
1.290000E 03	5	2.736990E 02
1.320000E 03	5	2.736780E 02
1.350000E 03	S	2.736594E 02

22

POINT-ID = 6

TIME	TYPE	VALUE
0.0	s s	3.000000E 02
3.000000E 01	S	2.973757E 02
10 ECCCCCC.	S	2.927366E 02
9.000000E 01	S	2.834036E 02
1.200000E 02	S	2.844485E 02
1.500000E 02	S	2.808765E 02
1.800000E 02	S	2.776692E 02
2.100000E 02	S S	2.747993E 02
2.400000E 02	S	2.722375E 02
2.700000E 02	Ş	2.599543E 02
3.000000E 02	Ş	2.679219E 02
3.3000COE 02	S	2.661138E 92
3.600000E 02	5 5 5 5	2.645051E 02
3,9000000 02	S	2.630771E 02
4.200000E 02	S	2.618074E 02
4.500000E 02	5	2.606790E 02
4.800000E 02	S	2.596763E 02
5.100000E 02	5	2.597852E 02 2.579932E 02
5,400000E 02 5,700000E 02	S S	
6.000000E 02	5 5	2.572893E 02 2.563636E 02
6.300000E 02	5 5	2.5610748 02
6.600000E 02	5	2.556130E 52
6.900000E 02	S	2 551732E 02
7.200000E 02	\$	2.547822E 02
7.50 3000E 02	S	2.544342E 02
7.800000E 02	Š	2.544342E 02 2.541248E 02
8,10000E 02	S	2.538494E 02
8.400000E 02	Š	2.536045E 02
8.700000E 02	S	2.503865E 02
9.000000E 02	S	2.531924E 02
9.300000E 02	S	2 530193£ 02
9.8000005 02	S	2 528561E 02
9.900000E 02	S	2.527293E 02
1.020000E 03	S	2.526075E G2
1.053000E 03	5 5 5 5	2 5249918 02
1.080000E 03	S	2.524026E 02
1.110000E 03	S	2.593167E 02
1.140000E 03	S	2.522402E 02
1.170000E 03	55555555	2.521721E 02
1.200000E 03	S	2.5211158 02
1.230000E 03	S	2.520575E 02
1.260000E 03	S	2.520094E 02
1.290000E 03	S	2.519666E 02
1.320000E 03	S	2.519285E 02
1.350000E 03	S	2.518945E 02

TIME .	TYPE	VALUE
0.0		3.000000E 02
	S	
3.000000E 01	S	2.943074E 02
6.000000E 01	s	2.850273E 02
9.000000E 01	S	2.773354E 02
1.200000E 02	s s	2.707917E 02
1.500000E 02	Š	2.551521E 02
	2	
1.600000E 02	S	2.602546E 02
2.100000E 02	S	2.559797E 02
2.400000E C2	S	2 52?340E 02
2.700000E 02	S	2.4894215 02
3.000000E 02	S	2.460421E 02
3.300000E 02	č	2.434825E 02
	\$ \$	
3.600000E 02	5	2.4121995 02
3.900000E 02	S	2.3921725 02
4.2000005 02	5	2.374428E 02
4.500000E 02	S	2.358694E 02
4.800000E 02	S	2.34473CE 02
5.100000E 02	Š	2.302332E 02
5.400GGGE 02	s s s	
	5	2.321318E 02
5.700000E 02	S	2.3:1530E 02
6.000000E 02	\$	2.362929E 02
6.300COCE C2	\$ \$	2.295092E 02
6.6000005 02	s s	2.288211E 02
6.9000COE 02	Š	2.282090E 02
7.200000E 02	Š	2.276644E 02
	s s	
7.5000G0E 02	5	2.271798E 02
. 7.800000E 02	S	2.267486E 02
8.100000E 02	S	2.263647E 02
8.400000E 02	S	2.2602298 02
8.70000CE 02	S	2.257188E C2
9.000000E 02	s s	2 254480E 02
9.300000E 02	Š	2.252070E C2
	3	
9.6000000 02	S	2.048923E 02
9.9000000 02	s s s s	2.248012E 02
1.0200C0E 03	S	2.246311E 02
1.050C00E 03	S	2.244797E 02
1.080000E 03	5	2.243448E 02
1.110000E 03	š	2.2422475 02
	3	
1.140000E 03	s s	2.24:1788 02
1.170000E 03	S	2.240224E 02
1.200000E 03	S	2.239377E 02
1.230000E 03	S S S S S	2.258522E 02
1.260000E 03	S	2.2379495 02
1.29000CE 03	Š	2.23735GE 02
1.320000E 03	Š	2.236816E 02
	3	
1.350000E 03	S	2.236341E 02

POINT-ID = &

TIME		TVOF	1/2 () ()
		TYPE	VALUE
0.0		S	3.000000E 02
3.000000E	01	S	2.939912E 02
6.000000E	C1	S	2.838540E 02
9.0000005	01	S	2.750923E 02
1.20000CE	02	S	2.675842E 02
1 500000E	02	S	2.611382E 02
1.8000000	02	S	2.555765E G2
2.1000003	ರ್ಷ	S	2.507527E 02
2.40000005	02	S	2.465491E 02
2.700000E	02	S S	2.4287125 02
3.000000E	02	S	2.396424E 02
3.3000COE	02	S	2.363002E+02
3.600000E	02	S	2.342928E 02
3.90000CE	02	S	2.320738E 02
4.2000COE	02	S	2.301155E 02
4.500000E	02	S	2.283778E 02
4.80000CE	02	S	2.268355E 02
5.100000E	02	s s	2.134635E 02
5.400000E	02	S	2.242534E 02
5.700000E	02	s	2,231738E 02
6.0000001	02	S	2.222141E 02
6.300000E	02	Š	2.213607E 02
6.500000E	02	s	2.206017E 02
.6.900000E		S	2.159264E 02
7.200000E	02		2.193255E 02
7.500000E	02	Š	2.167908E 02
7.8000005	02	9	2.133149E 02
8.1000COE	02	9 9 9 9 9	2.178912E 02
8.400000E	02	3	2.175141E 02
8.70)000E	02	5	2.171784E 02
9.00000E	02	S S	2.168794E 02
9.30000E	02	3	
	02	s s s	
9.60000E		5	2.163763E 02
9.90000E	02	5	2.161653E 02
1.02000E	03	5	2.159774E 02
1.050000E	03	S	2.158101E 02
1.08000E	03	s s	2.156612E 02
1.110000E	03	S	2.155285E 02
1.140000E	03	s s	2.1541C4E 02
1.1700COE	03	S	2.153052E 02
1.200000E	03	S	2.152114E 02
1.230000E	0.3	s s s	2.151281E 02
1.260000E	03	S	2.150538E 02
1.290000E	03	S	2.149876E 02
1.32000E	03	S	2.149286E 02
1.3500C0E	03	S	2.148761E 02

INPUT DATA OSTAINED FROM RESTART TAPE OF PROBLEM NINE

POINT-ID = 100

NON-LINEAR TRANSIENT PROBLEM

TIME				
3.000000E 01				
6.000000E 01 S 2.999995E 02 9.000000E 01 S 2.999998E 02 1.200000E 02 S 2.999988E 02 1.500000E 02 S 2.999988E 02 2.10000E 02 S 2.999988E 02 2.10000E 02 S 2.999988E 02 2.40000E 02 S 2.999988E 02 2.40000E 02 S 2.999988E 02 3.00000E 02 S 2.999988E 02 3.30000E 02 S 2.999988E 02 3.60000E 02 S 2.99988E 02 3.60000E 02 S 2.99988E 02 4.20000E 02 S 2.99988E 02 4.20000E 02 S 2.99988E 02 4.50000E 02 S 2.99988E 02 4.50000E 02 S 2.99988E 02 4.50000E 02 S 2.99988E 02 5.10000E 02 S 2.99988E 02 5.10000E 02 S 2.99988E 02 6.0000E 02 S 2.99988E 02 6.0000E 02 S 2.99988E 02 7.20000E 02 S 2.99988E 02 6.0000E 02 S 2.99988E 02 6.0000E 02 S 2.99988E 02 6.0000E 02 S 2.99988E 02 6.30000E 02 S 2.99988E 02 8.10000E 02 S 2.99980E 02 9.30000E 02 S 2.99980E 02			S	
9.000000E 01 S 2.99993E 02 1.200000E 02 S 2.999990E 02 1.500000E 02 S 2.999990E 02 1.600000E 02 S 2.999988E 02 2.100000E 02 S 2.99988E 02 2.100000E 02 S 2.99988E 02 2.700000E 02 S 2.99988E 02 3.00000E 02 S 2.99988E 02 3.300000E 02 S 2.99980E 02 3.600000E 02 S 2.99988E 02 3.500000E 02 S 2.99980E 02 4.20000E 02 S 2.99980E 02 4.20000E 02 S 2.99988E 02 4.50000E 02 S 2.99988E 02 4.50000E 02 S 2.99988E 02 4.50000E 02 S 2.99988E 02 5.10000E 02 S 2.99988E 02 6.0000CE 02 S 2.99988E 02 5.10000E 02 S 2.99988E 02 6.0000CE 02 S 2.99988E 02 6.0000CE 02 S 2.99988E 02 6.0000CE 02 S 2.99988E 02 6.30000E 02 S 2.99988E 02 6.90000E 02 S 2.99988E 02 8.10000E 02 S 2.99980E 02 9.00000E 02 S 2.99980E 02		_	5	
2.700000E 02 S 2.99988E 02 3.00000E 02 S 2.99988E 02 3.300000E 02 S 2.99980E 02 3.60000E 02 S 2.99980E 02 4.20000E 02 S 2.999880E 02 4.20000E 02 S 2.99983E 02 4.50000E 02 S 2.99983E 02 4.50000E 02 S 2.99983E 02 5.10000E 02 S 2.99983E 02 5.10000E 02 S 2.99983E 02 5.70000E 02 S 2.99983E 02 5.70000E 02 S 2.99983E 02 6.00000E 02 S 2.99983E 02 6.00000E 02 S 2.99983E 02 6.30000E 02 S 2.99980E 02 6.30000E 02 S 2.99980E 02 6.30000E 02 S 2.99980E 02 7.50000E 02 S 2.99980E 02 7.50000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02			S	
2.700000E 02 S 2.99988E 02 3.00000E 02 S 2.99988E 02 3.300000E 02 S 2.99980E 02 3.60000E 02 S 2.99980E 02 4.20000E 02 S 2.999880E 02 4.20000E 02 S 2.99983E 02 4.50000E 02 S 2.99983E 02 4.50000E 02 S 2.99983E 02 5.10000E 02 S 2.99983E 02 5.10000E 02 S 2.99983E 02 5.70000E 02 S 2.99983E 02 5.70000E 02 S 2.99983E 02 6.00000E 02 S 2.99983E 02 6.00000E 02 S 2.99983E 02 6.30000E 02 S 2.99980E 02 6.30000E 02 S 2.99980E 02 6.30000E 02 S 2.99980E 02 7.50000E 02 S 2.99980E 02 7.50000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02			S	
2.700000E 02 S 2.99988E 02 3.00000E 02 S 2.99988E 02 3.300000E 02 S 2.99980E 02 3.60000E 02 S 2.99980E 02 4.20000E 02 S 2.999880E 02 4.20000E 02 S 2.99983E 02 4.50000E 02 S 2.99983E 02 4.50000E 02 S 2.99983E 02 5.10000E 02 S 2.99983E 02 5.10000E 02 S 2.99983E 02 5.70000E 02 S 2.99983E 02 5.70000E 02 S 2.99983E 02 6.00000E 02 S 2.99983E 02 6.00000E 02 S 2.99983E 02 6.30000E 02 S 2.99980E 02 6.30000E 02 S 2.99980E 02 6.30000E 02 S 2.99980E 02 7.50000E 02 S 2.99980E 02 7.50000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02			S	
2.700000E 02 S 2.99988E 02 3.00000E 02 S 2.99988E 02 3.300000E 02 S 2.99980E 02 3.60000E 02 S 2.99980E 02 4.20000E 02 S 2.999880E 02 4.20000E 02 S 2.99983E 02 4.50000E 02 S 2.99983E 02 4.50000E 02 S 2.99983E 02 5.10000E 02 S 2.99983E 02 5.10000E 02 S 2.99983E 02 5.70000E 02 S 2.99983E 02 5.70000E 02 S 2.99983E 02 6.00000E 02 S 2.99983E 02 6.00000E 02 S 2.99983E 02 6.30000E 02 S 2.99980E 02 6.30000E 02 S 2.99980E 02 6.30000E 02 S 2.99980E 02 7.50000E 02 S 2.99980E 02 7.50000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02			S	
2.700000E 02 S 2.99988E 02 3.00000E 02 S 2.99988E 02 3.300000E 02 S 2.99980E 02 3.60000E 02 S 2.99980E 02 4.20000E 02 S 2.999880E 02 4.20000E 02 S 2.99983E 02 4.50000E 02 S 2.99983E 02 4.50000E 02 S 2.99983E 02 5.10000E 02 S 2.99983E 02 5.10000E 02 S 2.99983E 02 5.70000E 02 S 2.99983E 02 5.70000E 02 S 2.99983E 02 6.00000E 02 S 2.99983E 02 6.00000E 02 S 2.99980E 02 6.30000E 02 S 2.99980E 02 6.30000E 02 S 2.99980E 02 6.30000E 02 S 2.99980E 02 7.50000E 02 S 2.99980E 02 7.50000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02			S	
2.700000E 02 S 2.99988E 02 3.00000E 02 S 2.99988E 02 3.300000E 02 S 2.99980E 02 3.60000E 02 S 2.99980E 02 4.20000E 02 S 2.999880E 02 4.20000E 02 S 2.99983E 02 4.50000E 02 S 2.99983E 02 4.50000E 02 S 2.99983E 02 5.10000E 02 S 2.99983E 02 5.10000E 02 S 2.99983E 02 5.70000E 02 S 2.99983E 02 5.70000E 02 S 2.99983E 02 6.00000E 02 S 2.99983E 02 6.00000E 02 S 2.99980E 02 6.30000E 02 S 2.99980E 02 6.30000E 02 S 2.99980E 02 6.30000E 02 S 2.99980E 02 7.50000E 02 S 2.99980E 02 7.50000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02			S	
7.800000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 8.40000E 02 S 2.99980E 02 9.00000E 02 S 2.99980E 02 9.30000E 02 S 2.99980E 02 9.60000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02			S	
7.800000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 8.40000E 02 S 2.99980E 02 9.00000E 02 S 2.99980E 02 9.30000E 02 S 2.99980E 02 9.60000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02			5	
7.800000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 8.40000E 02 S 2.99980E 02 9.00000E 02 S 2.99980E 02 9.30000E 02 S 2.99980E 02 9.60000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02			S	2.999985E 02
7.800000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 8.40000E 02 S 2.99980E 02 9.00000E 02 S 2.99980E 02 9.30000E 02 S 2.99980E 02 9.60000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02			S	2.999980E 02
7.800000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 8.40000E 02 S 2.99980E 02 9.00000E 02 S 2.99980E 02 9.30000E 02 S 2.99980E 02 9.60000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02			S	2.99985E 02
7.800000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 8.40000E 02 S 2.99980E 02 9.00000E 02 S 2.99980E 02 9.30000E 02 S 2.99980E 02 9.60000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02	3.90000E		5	
7.800000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 8.40000E 02 S 2.99980E 02 9.00000E 02 S 2.99980E 02 9.30000E 02 S 2.99980E 02 9.60000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02			S	
7.800000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 8.40000E 02 S 2.99980E 02 9.00000E 02 S 2.99980E 02 9.30000E 02 S 2.99980E 02 9.60000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02			S	
7.800000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 8.40000E 02 S 2.99980E 02 9.00000E 02 S 2.99980E 02 9.30000E 02 S 2.99980E 02 9.60000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02			S	
7.800000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 8.40000E 02 S 2.99980E 02 9.00000E 02 S 2.99980E 02 9.30000E 02 S 2.99980E 02 9.60000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02	5.100000E	02	5	2.900933E 02
7.800000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 8.40000E 02 S 2.99980E 02 9.00000E 02 S 2.99980E 02 9.30000E 02 S 2.99980E 02 9.60000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02	5.40000CE	02	S	2.999980E C2
7.800000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 8.40000E 02 S 2.99980E 02 9.00000E 02 S 2.99980E 02 9.30000E 02 S 2.99980E 02 9.60000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02	5.700000E	02	S [.]	2.999983E 02
7.800000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 8.40000E 02 S 2.99980E 02 9.00000E 02 S 2.99980E 02 9.30000E 02 S 2.99980E 02 9.60000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02	6.000000E	02	S	2.999980E 02
7.800000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 8.40000E 02 S 2.99980E 02 9.00000E 02 S 2.99980E 02 9.30000E 02 S 2.99980E 02 9.60000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02	6.300000E	02	S	2.999983E 02
7.800000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 8.40000E 02 S 2.99980E 02 9.00000E 02 S 2.99980E 02 9.30000E 02 S 2.99980E 02 9.60000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02	6.600000E	02	S	2.999980E 02
7.800000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 8.40000E 02 S 2.99980E 02 9.00000E 02 S 2.99980E 02 9.30000E 02 S 2.99980E 02 9.60000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02	6.9000CE	02	S	2.999983E 02
7.800000E 02 S 2.99980E 02 8.10000E 02 S 2.99980E 02 8.40000E 02 S 2.99980E 02 9.00000E 02 S 2.99980E 02 9.30000E 02 S 2.99980E 02 9.60000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02 9.90000E 02 S 2.99980E 02	7.200000E	02	S	2.999980E 02
8.100000E 02 S 2.995980E 02 8.400000E 02 S 2.995980E 02 9.000000E 02 S 2.99980E 02 9.300000E 02 S 2.99980E 02 9.60000E 02 S 2.99980E 02 9.900000E 02 S 2.99980E 02 9.900000E 02 S 2.99980E 02 1.020000E 03 S 2.99980E 02	7.500000E	02	S	2.999980E 02
8.100000E 02 S 2.995980E 02 8.400000E 02 S 2.995980E 02 9.000000E 02 S 2.99980E 02 9.300000E 02 S 2.99980E 02 9.60000E 02 S 2.99980E 02 9.900000E 02 S 2.99980E 02 9.900000E 02 S 2.99980E 02 1.020000E 03 S 2.99980E 02	7.800000E	02	S	2.5999808 02
9.300000E 02	8.100000E	.02	· S	2.999980E 02
9.300000E 02	8.40000GE	0.2	S	2.990980E 02
9.300000E 02	8.7000005	02	S	2.999980E 02
9.300000E 02	3000000E	32	S	2 999980E 02
9.600000E 02 S 2.999980E 02 9.900000E 02 S 2.99960E 02 1.020000E 03 S 2.99980E 02	9.300000E	02	\$	2.999980E 02
9.900000E 02	9.600000E	02	S	2.909980E 02
1.0200C0E 03	9.900000E	02	S	2.999980E 02
1.050000E 03 S 2.999980E 02 1.080000E 03 S 2.999980E 02 1.110000E 03 S 2.999980E 02 1.170000E 03 S 2.99980E 02 1.200000E 03 S 2.99980E 02 1.230000E 03 S 2.99980E 02 1.260000E 03 S 2.999980E 02	1.0200CGE	03	S	2.099930E 02
1.080000E 03 S 2.99990E 02 1.11000E 03 S 2.99990E 02 1.17000E 03 S 2.99980E 02 1.20000E 03 S 2.99980E 02 1.20000E 03 S 2.99990E 02 1.23000E 03 S 2.99990E 02 1.26000E 03 S 2.99990E 02	1.050000E	03	S	2.99998CE 02
1.110000E 03	1.080000E	03	S	2.9999808 02
1.140000E 03 S 2.999980E 02 1.170000E 03 S 2.999980E 02 1.200000E 03 S 2.999980E 02 1.230000E 03 S 2.999980E 02 1.260000E 03 S 2.999980E 02	1.110000E	03	S	2.999980E 02
1.170000E 03 S 2.999980E 02 1.200000E 03 S 2.999980E 02 1.230000E 03 S 2.999980E 02 1.260000E 03 S 2.999980E 02	1.140000E	03	S	2.999980E 02
1.200000E 03 S 2.999980E 02 1.230000E 03 S 2.999980E 02 1.260000E 03 S 2.999980E 02	1.170000E	03	Ş	2.999980E 02
1.230000E 03 S 2.999980E 02 1.260000E 03 S 2.999980E 02	1.200000E		S	
1.260000E 03 \$ 2.999980E 02	1.230000E	03	S	
			S	
1,290000E 03 S 2.999980E 02	1,290000E	03	Š	2.999980E 02
1.320000E 03 \$ 2.999980E 02			Š	
1.350000E 03 S 2.999980E 02			S	

```
NASTRAN LOADED AT LOCATION GFAF20
TIME TO GO = 59 CPU SEC., 293 I/O SEC.
                       O ELAPSED-SEC.
                                            SEM1
                                                 BEGN
     O CPU-SEC.
                                            SEMT
     O CPU-SEC.
                       O ELAPSED-SEC.
                       7 ELAPSED-SEC.
                                            NAST
     O .CPU-SEC.
                                            GNFI
     O CPU-SEC.
                       7 ELAPSED-SEC.
                                            XCSA
     O CPU-SEC.
                       7 ELAPSED-SEC.
     2 CPU-SEC.
                       14 ELAPSED-SEC.
                                            IFP1
                                            XSOR
     2 CPU-SEC.
                       10 ELAPSED-SEC.
     2 CPU-SEC.
                       31 ELAPSED-SEC.
                                             DO IFP
                       53 ELAPSED-SEC.
                                            END
                                                 IFP
     3 CPU-SEC.
                                            XGPI
     3 CPU-SEC.
                       53 ELAPSED-SEC.
     5 CPU-SEC.
                       78 ELAPSED-SEC.
                                            SEM1 END
     5 CPU-SEC.
                       80 ELAPSED-SEC.
                                                  LINKNSO3 ---
    29 I/O SEC.
                       40016 BYTES OF OPEN CORE
LAST LINK DID NOT USE
                                                 LINK END ---
                       83 ELAPSED-SEC.
                                            ----
     5 CPU-SEC.
                                            XSFA
     5 CPU-SEC.
                       84 ELAPSED-SEC.
                      100 ELAPSED-SEC.
                                            XSFA
     5 CPU-SEC.
                                                          BEGN
     5 CPU-SEC.
                      100 ELAPSED-SEC.
                                            27
                                                  SMA1
                                            27
                                                  SMA1
                                                          END-
     6 CPU-SEC.
                      105 ELAPSED-SEC.
     6 CPU-SEC.
                      106 ELAPSED-SEC.
                                            30
                                                  SMA2
                                                          BEGN
     6 CPU-SEC.
                      113 ELAPSED-SEC.
                                            30
                                                  SMA2
                                                          END
     6 CPU-SEC.
                      1.5 ELAPSED-SEC.
                                                  LINKNSO5 ---
    43 1/0 SEC.
LAST LINK DID NOT USE 64268 SYTES OF OPEN CORE
                                            ---- LINK END ---
     6 CPU-SEC.
                      119 ELAPSED-SEC.
                                            35
                                                  RMG
     6 CPU-SEC.
                      119 ELAPSED-SEC.
     6 CPU-SEC.
                      124 ELAPSED-SEC.
                                            SDCO
                                                  MP
                                            SDCO MP
     6 CPU-SEC.
                      125 ELAPSED-SEC.
     6 CPU-SEC.
                      126 ELAPSED-SEC.
                                            FBS
     6 CPU-SEC.
                      129 ELAPSED-SEC.
                                            FBS
     6 CPU-SEC.
                      130 ELAPSED-SEC.
                                            MPYA
                                                 D
                                                  METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                  0.0
     5 CPU-SEC.
                      131 ELAPSED-SEC.
                                            MPYA D
                                            TRAN
                                                 POSE .
     6 CPU-SEC.
                      132 ELAPSED-SEC.
                                                 POSE
     6 CPU-SEC.
                      134 ELAPSED-SEC.
                                            TRAN
     6 CPU-SEC.
                      134 ELAPSED-SEC.
                                            MPYA
                                                  D
                                                  METHOD 2 NT, NBR PASSES = 1, EST. TIME =
                                                                                                  0.0
     6 CPU-SEC.
                      135 ELAPSED-SEC.
                                            MPYA
                                                 D
                                                  RMG
                                                           END
     7 CPU-SEC.
                      138 ELAPSED-SEC.
                                            35
                                                  LINKNSO4 ---
     7 CPU-SEC.
                      141 ELAPSED-SEC.
                                            ----
     60 I/O SEC.
 LAST LINK DID NOT USE
                       72520 EYTES OF OPEN CORE
     7 CPU-SEC.
                      147 ELAPSED-SEC.
                                            ---- LINK END ---
                                            46
                                                  GPSP
                                                           BEGN
     7 CPU-SEC
                      147 ELAPSED-SEC.
                      147 ELAPSED-SEC.
                                            46
                                                  GPSP
                                                           END
     7 CPU-SEC.
                                            ---- LINKNS14 ---
     7 CPU-SEC.
                      147 ELAPSED-SEC.
     65 I/O SEC.
 LAST LINK DID NOT USE 138192 BYTES OF OPEN CORE
      7 CPU-SEC.
                                            ---- LINK END ---
                      154 ELAPSED-SEC.
                                            47
                                                  OFP
      7 CFU-SEC.
                      154 ELAPSED-SEC.
                                                           BEGN
                                            47
                                                  OFP
                                                           END
      7 CPU-SEC.
                      134 ELAPSED-SEC.
                                                  LINKNSO4 ---
      7 CPU-SEC.
                       156 ELAPSED-SEC.
     63 I/O SEC.
 LAST LINK DID NOT USE 115664 BYTES OF OPEN CORE
```

```
7 CPU-SEC.
                    162 ELAPSED-SEC.
                                          ---- LINK END ---
    7 CPU-SEC.
                    162 ELAPSED-SEC.
                                         53
                                               MCE2
                                                       BEGN
    7 CPU-SEC.
                    167 ELAPSED-SEC.
                                         MPYA D
                                               METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                             0.0
    8 CPU-SEC.
                    169 FLAFSED-SEC.
                                         MPYA D
    8 CPU-SEC.
                    169 ELAPSED-SEC.
                                         MPYA D
                                               METHOD 2 T .NBR PASSES =
                                                                          1.EST. TIME =
                                                                                             0.0
    8 CPU-SEC.
                    172 ELAPSED-SEC.
                                         MPYA D
    8 CPU-SEC.
                                         MPYA D
                    172 ELAPSED-SEC.
                                               METHOD 2 T .NBR PASSES =
                                                                          1.EST. TIME =
                                                                                             0.0
    8 CPU-SEC.
                    176 ELAPSED-SEC.
                                         MPYA D
    8 CPU-SEC.
                    179 ELAPSED-SEC.
                                         MPYA D
                                               METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                             0.0
    9 CPU-SEC.
                     180 ELAPSED-SEC.
                                         MPYA D
    9 CPU-SEC.
                    1E1 ELAPSED-SEC.
                                         MPYA D
                                               METHOD 2 T .NBR PASSES =
                                                                          1.EST. TIME =
                                                                                             0.0
    9 CPU-SEC.
                    183 ELAPSED-SEC.
                                         MPYA D
    9 CPU-SEC.
                    183 ELAPSED-SEC.
                                         MPYA D
                                               METHOD 2 T .NBR PASSES =
                                                                          1.EST. TIME =
                                                                                             0.0
    9 CPU-SEC.
                    185 ELAPSED-SEC.
                                         MPYA D
   10 CPU-SEC.
                    188 ELAPSED-SEC.
                                         MPYA D
                                               METHOD 2 NT.NBR PASSES = 1.EST. TIME *
                                                                                             0.0
   10 CPU-SEC.
                     190 ELAPSED-SEC.
                                         MPYA D
   10 CPU-SEC.
                    191 ELAFSED-SEC.
                                         MPYA D
                                               METHOD 2 T .NBR PASSES =
                                                                          1.EST. TIME =
                                                                                             0.0
   10 CPU-SEC.
                    192 ELAPSED-SEC.
                                         MPYA D
   10 CPU-SEC.
                    193 ELAPSED-SEC.
                                         MPYA D
                                               METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                             0.0
                                         MPYA D
   10 CPU-SEC.
                    195 ELAPSED-SEC.
   11 CPU-SEC.
                    197 ELAPSED-SEC.
                                         53
                                               MCE2
                                                       END
   11 CPU-SEC.
                    202 ELAPSED-SEC.
                                         ---- LINKNS10 ---
   91 I/O SEC.
LAST LINK DID NOT USE 102132 BYTES OF OPEN CORE
   11 CPU-SEC.
                    208 ELAPSED-SEC.
                                         ---- LINK END ---
   11 CPU-SEC.
                    208 ELAPSED-SEC.
                                         88 GKAD
                                                       BEGN
   11 CPU-SEC.
                    212 ELAPSED-SEC.
                                         88
                                               GKAD
                                                       END
   11 CPU-SEC.
                    2 3 ELAFSED-SEC.
                                         XSFA
   11 CPU-SEC.
                    2:3 ELAPSED-SEC.
                                         XSFA
   11 CPU-SEC.
                    218 ELAPSED-SEC.
                                         ---- LINKNS05 ---
   96 I/O SEC.
LAST LINK DID NOT USE 109852 BYTES OF OPEN CORE
   11 CPU-SEC.
                    223 ELAPSED-SEC.
                                         ---- LINK END ---
   11 CPU-SEC.
                    223 ELAPSED-SEC.
                                         92
                                               TRLG
                                                       BEGN
   11 CRU-SEC.
                    236 ELAPSED-SEC.
                                         MPYA D
                                               METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                             0.0
   11 CPU-SEC.
                     238 ELAPSED-SEC.
                                         MPYA D
   12 CPU-SEC.
                    243 ELAPSED-SEC.
                                         MPYA D
                                               METHOD 2 NT. NBR PASSES = '1.EST. TIME =
                                                                                             0.0
                                         MPYA D
   12 CPU-SEC.
                    2:6 ELAPSED-SEC.
   12 CPU-SEC.
                    246 ELAPSED-SEC.
                                               METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                             0.0
   12 CPU-SEC.
                                         MPYA D
                     249 ELAPSED-SEC.
   12 CPU-SEC.
                    251 ELAPSED-SEC.
                                         MPYA D
                                                                                             0.0
                                               METHOD 2 NT.NBR PASSES = 1.EST. TIME =
   12 CPU-SEC.
                     233 ELAPSED-SEC.
                                         MPYA D
   12 CPU-SEC.
                     253 ELAPSED-SEC.
                                         92
                                               TRLG
                                                      END
   12 CPU-SEC.
                    255 ELAPSED-SEC.
                                         ---- LINKNS11 ---
  110 I/O SEC.
LAST LINK DID NOT USE 58172 BYTES OF OPEN CORE
   13 CPU-SEC.
                    260 ELAPSED-SEC.
                                         ---- LINK END ---
   13 CPU-SEC.
                    260 ELAFSED-SEC.
                                         97
                                               TRHT
                                                        BEGN
                                         DECO MP
  13 CPU-SEC.
                    265 ELAPSED-SEC.
                                         DECO MP
   13 CPU-SEC.
                    267 ELAPSED-SEC.
```

TRHT

97

END

15 CPU-SEC.

339 ELAPSED-SEC.

```
---- LINKNS12 ---
    15 CPU-SEC.
                    340 ELAPSED-SEC.
 170 L.D SEC.
LAST LINK DID NOT USE 69268 EYTES OF OPEN CORE
    15 CPU-SEC.
                    350 ELAPSED-SEC.
                                        ---- LINK END ---
    13 CPU-SEC.
                    DEG ELAPSED-SEC.
                                         99
                                               VDR
                                                       BEGN
    15 CPU-SEC.
                    355 ELAPSED-SEC.
                                         29
                                               VDR
                                                       END
    15 CPU-SEC.
                    DEG ELAPSED-SEC.
                                         111
                                               PARAM
                                                       BEGN
    15 CPU-SEC.
                    356 ELAPSED-SEG.
                                         111
                                               PARAM
                                                       END
    15 CPU-SEC.
                    SE7 ELAPSED-SEC.
                                         115
                                               SDR1
                                                       BEGN
    15 CPU-SEC.
                    357 ELAPSED-SEC.
                                         MPYA
                                              D
                                               METHOD 2 NT.NBR PASSES = 1.EST. TIME =
    15 CPU-SEC.
                                         MEYA
                                              D
                    BEG ELAPSED-SEC.
    16 CPU-SEC.
                    365 ELAPSED-SEC.
                                         115 SDR1 END
    16 CPU-SEC.
                    366 EL4PSED-SEC.
                                         ---- LINKNSO8 ---
   182 I/O SEC.
LAST LINK DID NOT USE 119098 BYTES OF OPEN CORE
    16 CPU-SEC.
                    S19 ELAPSED-SEC.
                                         ---- LINK END ---
    1d CPU-SEC.
                     379 ELAPSED-SEC.
                                         119 PLTTRAN BEGN
    16 CPU-SEC.
                                               PLTTRAN END
                    381 ELAPSED-SEC.
                                         119
    16 CPU-SEC.
                    382 ELAPSED-SEC.
                                         XSFA
    16 CPU-SEC.
                     382 ELAPSED-SEC.
                                         XSFA
    16 CPU-SEC.
                     380 ELAPSED-SEC.
                                         ---- LINKNS13 ---
   185 I/O SEC.
LAST LINK DID NOT USE 107809 BYTES OF OPEN CORE
    10 CPU-SEC. 384 ELARSED-SEC.
                                        ---- LINK END ---
    16 CPU-SEC.
                     384 ELPASED-SEC.
                                         120 SDR2
                                                     BEGN
    13 CPU-SEC.
                     387 ELAPSED-SEC.
                                         120 SDR2
                                                       END
    16 CPU-SEC.
                     388 ELAPSED-SEC.
                                         ---- LINKNS.14 ---
= 191 I/O SEC.
LAST LINK DID NOT USE 66428 BYTES OF OPEN CORE
    10 CPU-SEC.
                     394 ELAPSED-SEC.
                                       ---- LINK END ---
    16 CPU-SEC.
                     394 ELAPSED-SEC.
                                         121 SDR3 BEGN
    13 CPU-SEC.
                     398 ELAPSED-SEC.
                                         121
                                               SDR3
                                                       END
    16 CPU-SEC.
                     398 ELAPSED-SEC.
                                        123
                                               OFP
                                                       BEGN
    17 CPU-SEC.
                    402 ELAPSED-SEC.
                                               OFP
                                         123
                                                       END
    17 CPU-SEC.
                    403 ELAFSED-SEC.
                                        130
                                               XYTRAN BEGN
    17 CPU-9EC.
                     403 ELAPSED-SEC.
                                         130 XYTRAN END
    17 CPU-SEC.
                    403 ELAPSED-SEC.
                                              LINKNSO2 ---
  200 I/O SEC.
 LAST LINK DID NOT USE 11408 BYTES OF OPEN CORE
    17 CPU-SEC.
                   410 ELAPSED-SEC.
                                        --- LINK END ---
    17 CPU-SEC.
                     410 ELAPSED-SEC.
                                               XYPLOT BEGN
                                         132
    17 CPU-SEC.
                     410 ELAPSED-SEC.
                                         132
                                               XYPLOT END
    17 CPU-SEC.
                     411 ELAPSED-SEC.
                                         138
                                               EXIT
                                                       BEGN
= 202 I/O SEC.
LAST LINK DID NOT USE $7232 BYTES OF OPEN CORE
AMOUNT OF OPEN CORE NOT USED = 11K BYTES
```

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MIRANES MANAGEMENT MANAGEMENT AND MANAGEMENT
MMMMMMMM MMMMMMM MMME M MMMMMMMMM MMMMM MMMM MMMM MMMMMMMMM MMGMMM MARCHMINING MMMMMM/// /// M MM--MMM MMM: MMM MMM MNIMM MMMM MM MIMIMIMIMIM MARAMA M MMMMMM MMMM AM - - MMMMM MM MMM 1////// MINIMIMIN MMM MMMMM MM MANAGEMENT IN MINIM MMMM// /// ////MMM MMMM-- MMMMMM MINIMAL SIMPLE M MMM M MMM MM MMMM MMMMMMMMM MM MIM 1111 111 MMMMMMM - - - M MMMMMMM MMMMMMM M MHM MM MMMM MM MMMMMMMM MMMMM / /// ///MM MF - - MMMMMMM MMMMMMM MINISTRAMM MMMMMM MMMM MM AMN/MVMMVM 11111 // M MMMMM - - - MMMMMM MidSMM MEMMIAMIN M MMM MMMMMMMMMM MM MM////// MMMMMM MMMINMM IDMM MMMM - - - - MMMM M MRIMM MIMMMMMM M MM MMMM MM MMMM ////MMMMMM MM MITEMANN MMMMM - - - - M MM MMM MMMMM MM MMMM MMMMMM MMMM MM MM

MWWMMW - - MWMWWW 45 MWMWMM - - MWMWMW

MIAMMM - - MESSIMMENDIA MESSIMMENTA MESSIM

IBM 360-370 SERIES MODELS 91,95

RIGID FORMAT SERIES M

LEVEL 15.5.3

MM MMMM MM MMMMMM MMMMM

MMM

SYSTEM GENERATION DATE - 12/31/74

1

```
$ START OF EXECUTIVE CONTROL ********************************
ID CLASS PROBLEM ELEVEN. C.E. JACKSON
$ MAXIMUM CPU TIME ALLOWED FOR THE JOB
$
TIME 10
$ THE THERMAL ANALYZER PORTION OF NASTRAN IS TO BE USED
APP HEAT
$ THE NON-LINEAR TRANSIENT SOLUTION ALGORITHM IS TO BE USED
$
SOL 9
$
$ REQUEST FOR DIAGNOSTIC WHICH PRINTS OUT CONVERGENCE CRITERIA
$ PRODUCES CUTPUT ONLY FOR SOL 3
DI4G 18
$ THE FOLLOWING ALTER IS REQUIRED TO CORRECTLY PUNCH OUT TEMPERATURE CARDS
$ DURING A TRANSIENT RUN
3
ALTER 120
OFP HOUPVI,.... // V.N.HCARDNO $
SAVE HCARDNO S
ENDALTER
CEND
```

CASE CONTROL DECK ECHO

```
CARD
 COUNT
         $ END OF EXECUTIVE CONTROL --- START CASE CONTROL ********
  3
  5
         TITLE=
                     NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIED
         SUBTITLE=
                          AND TEMPERATURE CARDS PUNCHED.
         $ SPECIFY 51 LINES OF DATA PER PAGE (DOES NOT INCLUDE HEADINGS AT TOP OF PAGE)
 10
 11
         LINE=51
 12
 13
         $ REQUEST SORTED AND UNSORTED OUTPUT
 14
         $ IF THIS CARD IS OMITTED, ONLY THE SORTED BULK DATA_WILL APPEAR
 15
 16
         ECHO=BOTH
 17
 18
         $ SELECT THE MPC AND LOAD SETS TO BE USED IN THIS SOLUTION
         $ NOTE THAT NO SPC SET IS SELECTED. AND THAT DLOAD HAS REPLACED LOAD.
 19
         $ THE DLOAD CARD NOW REFERENCES SET 800 FOR PROBLEM ELEVEN
 20
 21
         $ INSTEAD OF 300 AS IN PROBLEM THREE
 22
 23
         MPC=200
 24
         DLOAD=800
 25
         $ SELECT THE TEMPERATURE SET WHICH IS AN ESTIMATE OF THE FINAL SOLUTION VECTOR
 26
         $ THE SELECTION OF THIS SET IS OPTIONAL FOR SOL 9. BUT SHOULD BE MADE IF
 27
 28
         $ THE FINAL TEMPERATURE IS SEVERAL HUNDRED DEGREES DIFFERENT FROM THE
 29
         $ IC VECTOR AND RADIATIVE INTERCHANGES ARE INCLUDED.
 30
 31
         TEMP(MATERIAL)=400
 32
 33
         $ SELECT THE STEP SIZE. NUMBER OF INCREMENTS, AND PRINTOUT FREQUENCY
 34
 35
         TSTEP=500
 36
 37
         $ SELECT THE TEMPERATURE SET DEFINING THE TEMPERATURE VECTOR AT T=0.
 38
         $
 39
         IC=600
 40
         $
 41
         S SELECT OUTPUT DESIRED
 42
         $
 43
         OUTPUT
 44
 45
         $ REQUEST PUNCHED THERMAL DATA
         $ THE PUNCH UNIT HAS BEEN DIRECTED TO THE PRINTER SO THAT THE PUNCHED
- 46
 47
         $ DATA MAY BE VIEWED DIRECTLY.
         S THE PUNCHED CARDS WILL BE FORMATTED CORRECT. / ONLY IF SORT1 OUTPUT
 48
         $ IS USED. THE USER MAY EMPLOY THE ALTER PRESENT IN PROBLEM FOUR.
 49
 50
         S WHICH WILL PROVIDE ALL OUTPUT IN SORT1 FORM, OR HE MAY USE THE ALTER AS IN .
 51
         $ THIS PROBLEM. WHICH WILL PRODUCE SORT2 THERMAL OUTPUT IN ADDITION TO
```

3 .

CASE CONTROL DECK ECHO

```
CARD
COUNT
52
       $ SORT1 FORMATTED THERMAL OUTPUT.
53
54
       THERMAL(PUNCH)=ALL
55
5ô
       $ DZFINE A GROUP OF GRID POINTS TO BE REFERENCED BY AN OUTPUT REQUEST
57
58
       SET 5 = 1, 2, 3, 4, 5, 6, 7, 8, 100
59
60
       $ REFERENCE A PREVIOUSLY DEFINED GROUP OF GRID POINTS
61
       $
62
       OLOAD=5
63
64
       $ THE FOLLOWING CARDS REQUEST 4 FRAMES OF TRANSIENT PLOTS
65
       $ THESE PLOTS WILL BE PRODUCED IMMEDIATELY ON THE PRINTER
66
67
       OUTPUT(XYOUT)
68
       XTITLE=TIME IN SECONDS
69
       YTITLE= DEGREES CELSIUS GP(100,1,4)
70
       S 'DISP' MEANS THAT THE GRID POINT TEMPERATURE WILL BE PLOTTED VERSUS TIME
71
72
       $ 'T1' IS REQUIRED (VESTIGIAL REMNANT FROM THE STRUCTURAL VERSION OF NASTRAN)
73
       $ ALL OF THESE PLOTS WILL APPEAR ON ONE FRAME
74
75
       XYPAPLOT DISP/100(T1), 1(T1), 4(T1)
76
       XTITLE=TIME IN SECONDS
77
       YTITLE= DEGREES CELSIUS PER SECOND GP(100.1,4)
78
79
       $ 'VELO' MEANS THAT THE THERMAL VELOCITY WILL 3E PLOTTED AS A FUNCTION OF TIME
80
       $ THESE THREE PLOTS WILL APPEAR ON THREE DIFFERENT FRAMES
81
82
       XYPAPLOT VELO/100(T1)/1(T1)/4(T1)
83
84
85
       86
       87
88
       BEGIN BULK
```

AND TEMPERATURE CARDS PUNCHED.

INPUT BULK DATA DECK ECHO

```
1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 .
$ UNITS MUST BE CONSISTENT
S IN THIS PROBLEM. METERS. WATTS. AND DEGREES CELSIUS ARE USED
S DEFINE GRID POINTS
$
GRID
                               0.
                                       U.
GRID
       2
                       . 1
                               0
                                       0
GRID
       3
                        . 2
                               0
                                       Ω
GRID
       Δ
                       . 3
                               ο.
                                       ō.
GRID
       5
                                       Ō.
                       ο.
GRID
                       . 1
                                       G.
GRID
                        . 2
                               . 1
                                       0.
GRID
       8
                       . 3
                                       ο.
                               . 1
GRID
       9
                       Ο.
                               . 2
                                       ο.
GRID
                       Ο.
                                       Ο.
       10
                               - . 1
GRID
       100
                       - . 05
                               . 05
                                       Ο.
$
$ CONNECT GRID POINTS
$
CROD
                       10
CROD
        20
                100
                       9
                               6
CQUAD2 30
                200
                               2
                                               5
                       1
                                       6
CQUAD2 40
                200
                       2
                                       7
                               3
                                               6
COUAD2 50
               200
                       3
$ DEFINE CROSS-SECTIONAL AREAS AND/OR THICKNESSES
S
PROD
       100
                        .001
                1000
POUAD2 200
                1000
                       . 01
$ DEFINE MATERIAL THERMAL CONDUCTIVITY AND THERMAL MASS
$
MAT4 1000
               200.
                       2.426+6
                                                                      ALUMINUM
$ DEFINE CONVECTIVE AREA AND CONVECTIVE COEFFICIENT 'H'
S
CHBDY 60
               300
                       LINE
                                       5
                                                                      +CONVEC
+CONVEC 100
               100
PHSDY
       300
               3000
                       .314
MAT4
       3000
               200.
$
$ DEFINE CONSTRAINTS
$
MPC
       200
               9
                               1.
                                                       -1.
MPC
       200
               10
                               1.
                                                       -1.
$
$ DEFINE APPLIED LOADS
SLOAD 300
                                       8.
               1
```

AND TEMPERATURE CARDS PUNCHED.

\$

INPUT BULK DATA DECK ECHO 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 . SLOAD 300 3 8. 4 4. SLOAD 300 5 6 8. 4. SLOAD 300 7 8. 8 4. \$ THE FOLLOWING BULK DATA CARDS WERE ADDED TO CONVERT PROBLEM ONE TO \$ PROBLEM TWO. THE ONLY BULK DATA CARD REMOVED FROM THE PREVIOUS SOLUTION WAS 5 THE SPC CARD S THIS SPC1 CARD REPLACES THE SPC CARD REMOVED FROM ABOVE SPC1 100 1 \$ S RADIATION BOUNDARY ELEMENTS CHBDY 200 2000 AREA4 1 AREA4 2 CHBDY 300 2000 CHBDY 400 2000 AREA4 3 CHBDY 500 2000 AREA4 5 6 2 1 2000 AREA4 7 3 CHBDY 600 6 7 CHBDY 700 2000 AREA4 3 S EMISSIVITY OF RADIATING ELEMENT \$ PHBDY 2000 \$ ESTIMATE OF FINAL STEADY STATE SOLUTION VECTOR --- REFERENCED \$ BY TEMP(MATERIAL) IN CASE CONTROL \$ TEMP 400 100 300. TEMPS 400 300. \$ S PARAMETERS CONTROLLING RADIATION LOADING AND THE ITERATION LOOPING PARAM TABS 273.15 PARAM SIGMA 5.685E-8 PARAM MAXIT 8 PARAM EPSHT .0001 \$ DEFINITION OF THE RADIATION MATRIX S ALL OF THE RADIATION GOES TO SPACE 400 500 600 700 RADLST 200 300 RADMIX 1 Ο. Ο. Ο. Ο. 0. Ο. PADMIX 2 Ο. ο. Ο. 0. Ο. RADMIX 3 ο. Ο. Ο. Ο. RADMIX 4 0. Ο. Ο. RADMTX 5 Ο. ο. RADMTX 6 ο.

INPUT BULK DATA DECK ECHO

```
1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 .
$ THE FOLLOWING BULK DATA CARDS WERE ADDED FOR THE TRANSIENT SOLUTION .....
S THEY CONVERT PROBLEM TWO TO PROBLEM THREE
$ NOTE THAT THE SPC1 SET WAS NOT SELECTED IN CASE CONTROL
S NOTE THAT SPCF OUTPUT IS NOT REQUESTED IN TRANSIENT
S NOTE THAT THERMAL MASS WAS ACCED TO 'MAT4' CARD 1000
$ NOTE THAT THE DIAG CARD IN THE EXECUTIVE CONTROL WAS IRRELEVANT
S NOTE THAT THE LOAD REQUEST IN CASE CONTROL IS NOW A DLOAD REQUEST
$ TRANSIENT SINGLE POINT CONSTRAINT METHOD
$ CONSTRAIN GRID POINT 100 TO 300 DEGREES CELSIUS
                       100
CELAS2 300
               1.+5
                               1
SLOAD 300
               100
                       300,+5
$ DEFINES A CONSTANT LOAD SET APPLIED FROM T=0. TO T=1.+6 SECONDS
TLOAD2 300
               300
                                               1.+6
                                                                      +TL1
+TL1 0.
               Ο.
S DEFINES THE NUMBER OF INCREMENTS. THE STEP SIZE, AND THE PRINTOUT FREQUENCY
S REFERENCED IN CASE CONTROL AS 'TSTEP'
S EACH TIME STEP IS 30 SECONDS
TSTEP 500
               31
                       30.
                               1
S DEFINES A TEMPERATURE VECTOR --- REFER ICED IN CASE CONTROL AS 'IC'
$
TEMPD 600
$ THE FOLLOWING BULK DATA CARDS WERE ADDED TO THE DECK TO CONVERT
$ PROBLEM THREE TO PROBLEM ELEVEN. PROBLEM 11 DEMONSTRATES THE USE
$ OF TLOAD1. TABLED1. AND DELAY CARDS TO PRODUCE CYCLICAL LOADS.
$ ALSO, PUNCHED THERMAL DATA IS REQUESTED.
S IN ADDITION, A DLOAD BULK DATA CARD IS USED TO COMBINE TLOAD1
$ AND TLOAD2 LCAD SETS.
$ THE ONLY CHANGES OTHER THAN BULK DATA ALTERATIONS WERE THE SELECTION
S OF LOAD SET 800 IN THE CASE CONTROL INSTEAD OF 300. THE REQUEST
$ FOR THERMAL(PUNCH) INSTEAD OF SIMPLY THERMAL IN THE CASE CONTROL.
S AND THE INCLUSION OF AN ALTER IN THE EXECUTIVE CONTROL.
$ REFERENCE THE LOAD, DELAY, A'D TABLE CARDS WHICH WILL BE USED TO CREATE
S LOAD SET 700
TLOAD: 700
                       701
                                       703
               300
TLCAD1 710
               300
                       702
                                       703
S. DEFINE THE TABLE WHICH IS REFERENCED BY THE TLOAD1 CARDS
```

\$

\$

\$

\$

. 1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 TABLED1 703 +TABD1 +TA6D1 -1. Ο. -0.001 0. Ο. 1. 450. +TABD2 1. +TABD2 450.001 0. 451. 0. ENDT \$ DEFINE THE DELAY CARDS WHICH WILL BE USED DURING THE TABLE LOOKUP PROCEDURE DELAY 701 100 1.+6 DELAY 702 100 1 1.+6 1 900. DELAY 702 2 1 900. 3 1 900. DELAY 702 4 1 900. 5 1 900. DELAY 702 6 900. 7 1 900. 1 DELAY 702 900. 8 \$ COMBINE THE TLOAD1 SETS (700 AND 710) AND THE TLOAD2 SET (300). \$ DLOAD SET 800 MUST BE REQUESTED IN CASE CONTROL TO APPLY THESE SETS S SIMULTANEOUSLY.

1.0

700

1.0

710

INPUT BULK DATA DECK ECHO

ENDDATA TOTAL COUNT= 178

CLOAD 800

*** USER INFORMATION MESSAGE 207. BULK DATA NOT SORTED.XSORT WILL RE-ORDER DECK.

1.0

1.0

300

			s o	RTED	BUL	K D	LTA E	Сно		
CARD	_	_	_		_					
COUNT	. 1				5	6	7	8	9	10
1-			i.÷5	100	1					
2-			300	LINE	1	5				+CONVEC
3-	+CONVEC 1		00							
4-			2000	AREA4	1	2	6	5 6		
5-			2000	AREA4	2	3	7			
6 -			2000	AREA4	3	4	8	7		
7 -			2000	AREA4	5	6	2	1		
8-			000	AREA4	6	7	3	2		
9-			2000	AREA4	7	8	4	3		
10-			200	1	2	6	5			
11-			200	2	3	7	6			
12-			200	3	4	8	7			
13-			00	10	2					
14-			00	9	6					
15-			00	1	1.+6					
16-		02 2		1	900.	3	1	900.		
17-		02 4		1	900.	5	1	900.		
18-		02 6		1	900.	7	1	900.		
19-		02 8	Ì	1	900.					
20-			00	1	1.+6	1	1	900.		
21 -			.0	1.0	300.	1.0	700	1.0	710	
22-	GRID 1			0.0	0.0	0.0				
23-	GRID 2			. 1	0.0	0.0				
24 -	GRID 3			. 2	0.0	0.0				
25-	GRID 4			.3	0.0	0.0				
26-	GRID 5			0.0	. 1	0.0				
27-	GRID 6			. 1	. 1	0.0				
28-	GRID 7			.2	. 1	0.0				
29-	GRID 8			. З	. 1	0.0				
30-	GRID 9	1		0.0	. 2	0.0				
31 -	GRID 1	0		0.0	- , 1	0.0				
32 -	GRID 1	00		05	.05	0.0				
33-	MAT4 1	000 2	.00	2.426+6						ALUMINUM
34 -			00.							
35 -				1	1.	5	1	-1.		
36-			0	1	1,	1	1	-1,		•
37-	PARAM E	PSHT .	0001							
38-		B TIXA								
39-			.685E-8							
40-			73.15							
41 -			000	314						
42 -		000			90					
43 -			000	.01						
44-			000	.001						
45 -				400	500	600	700			
. 46-	RADMTX 1			0.0	0.0	0.0	0.0	0.0		
47 -	RADMTX 2			0.0	0.0	0.0	0.0			
48 -	RADMTX 3			0.0	0.0	5.0				
49 -	RADMTX 4		.0	0.0	0.0					
50-	RADMTX 5		.0	0.0						•
51-	RADMTX 6	0	.0							

Ο.

500

300

300

Ο.

31

702

30.

1

TLOAD1 710

TLCAD2 300

+TL1

TSTEP

ENDDATA

CARD COUNT

52-53-

54-

55-

56-57-

58 -59-

60 -

61-

62-

63-

64 -

65 -

66-

67-

68-

+TL1

0.0

9

		5	SORTE	о ви	. K D	д Т Д	ECHO		
. 1	2	3	3 4	5	6	7	8	9	10 .
SLOAD	300	1	4.	2	8.				
SLOAD	300	3	8.	4	4.				
SLOAD	300	5	4.	6	8.				
SLOAD	300	7	8.	8	4.				
SLOAD	300	100	300.+5						
SPC1	100	1	100						
TABLED1	703								+TABD1
+TAED1	-1.	Ο.	-0.001	Ο.	Ο.	1.	450.	1.	+TABD2
+TABD2	450.001	0.	451.	Ο.	ENDT				
TEMP	400	100	300.						
TEMPD	400	300.							
TEMPD	600	300.							
TLOAD1	700	300	701		703				

703

0.0

NASTRAN SOURCE PROGRAM COMPILATION DMAP-DMAP INSTRUCTION NO.

- *** USER WARNING MESSAGE 54,
 PARAMETER NAMED EPSHT NOT REFERENCED
- *** USER WARNING MESSAGE 54.
 PARAMETER NAMED MAXIT NOT REFERENCED
 - **NO ERRORS FOUND EXECUTE NASTRAN PROGRAM**
- *** USER INFORMATION MESSAGE FULL INTERNAL SPACE NODE AVAILABLE
- *** USER INFORMATION MESSAGE 6 ELEMENTS HAVE A TOTAL VIEW FACTOR (FA/A) LESS THAN 0.99
- *** USER INFORMATION MESSAGE 3023, B = 3 C = 0
- *** USER INFORMATION MESSAGE 3027, SYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

*** USER INFORMATION MESSAGE 3028, B = 5 BBAR = 5 CBAR = 1 R = 8

*** USER INFORMATION MESSAGE 3027, UNSYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

POINT-ID = 1

AND TEMPERATURE CARDS PUNCHED.

TIME		TYPE	VALUE	
0.0		S	7.999998E	00
3.000000E	01	S	7.99998E	00
	01	S	7.99998E	00
	01	S	7.999998E	00
	02	S	7.99998E	00
	02	Š	7.99998E	00
	02	s s s	7.999998E	00
	02	Š	7.999998E	00
	02	Š	7.999998E	CO
	02	Š	7.939998E	00
	02	s s	7.999998E	00
	02	Š	7.999998E	CO
	02	S	7.999998E	00
	02	S	7.999998E	00
4.2000COE	02	š	7.999998E	00
4.500000E	02	Š	7.999998E	00
4.800000E	02	S	3.999999E	00
5.100000E	02	S	3.999999E	00
5.40000CE	02	S	3.999999E	00
5.700000E	02	ç	3.999999E	00
6.000000E	02	s s	3.999999E	00
	02	S		00
6,300000E	02	S	3.995999E	00
6.600000E	02		3.99999E	00
6.900000E		S S	3.999995	
7.200000E	02		3.999999E	00
7.5000COE	02	S	3.99999E	00
7.800000E	02	S	3.999999E	00
8.100000E	02	S	3.99999E	00
8.400000E	02	S	3.99999E	00
8.700000E	02	s	3.99999E	00
9.0C0000E	02	s s	7.999998E	00
9.300000E	02	S	7 .999998E	00

POINT-ID = 2

LOAD VECTOR

TIME TYPE	VALUE
0.0 S	1.600000E 01
3.000000E 01 S	1.600000E 01
6.000000E 01 S	1.600000E 01
9.0000COE 01 S	1.600000E 01
1.200000E 02 S	1.600000E 01
1.500000E 02 S	1.6000COE 01
1.600000E 02 S	1.600000E 01
2.100000E 02 S	1.600COOE 01
6.000000E 01 S 9.00000E 01 S 1.200000E 02 S 1.500000E 02 S 1.600000E 02 S 2.100000E 02 S 2.400000E 02 S	1.600000E 01
2.700000E 02 S	1.600000E 01
2.700000E 02 S 3.000000E 02 S	1.6C0000E 01
3.300000E 02 S	1.600000E 01
3.600000E 02 S	1.6C00C0E 01
3.900000E 02 S	1.600000E 01
4.2000CCE 02 S	1.600000E 01
4.200000E 02 S 4.500000E 02 S 4.600000E 02 S 5.100000E 02 S	1.600000E 01
4.800000E 02 S	7.999999E 00
5.100000E 02 S	7.999999E 00
5.400000£ 02 S	7.999999E 00
5.400000£ 02 S 5.700000£ 02 S	7.999999E 00
6.000000E 02 S	7.99999E 00
6.300000E 02 S	7.999999E 00
6.600000E 02 S	7.999999E 00
6.900000E 02 S	7.99999E 00
7.200000E 02 S	7.999999E 00
7.500000E 02 S	7.999999E 00
7.200000E 02 S 7.500000E 02 S 7.800000E 02 S	7.999999E 00
8.100000E 02 S	7.999999E 00
8.400000E 02 S	7.999999E 00
8.700000E 02 S	7.99999E 00
9.00000CE 02 S	1.600000E 01
8.700000E 02 S 9.000000E 02 S 9.300000E 02 S	1.600000E 01

AND TEMPERATURE CARDS PUNCHED.

POINT-ID = 3

JIME		TYPE	VALUE	
0.0		S	1.600000E	01
3.000000E	01	S	1.600000E	01
6.000000E	01	s s	1.600000E	01
9.000000E	01	S	1.600000E	01
1.200000E	02	S	1.500000E	01
1.500000E	02	5	1.6C0000E	01
1.800000E	02	\$ \$ \$	1.600000E	01
2.100000E	02	S	1.600000E	01
2.4000COE	02	S	1.600000E	01
2.700000E	02	S	1.6C00C0E	01
3.000000E	02	S	1.60000E	01
3.30000CE	02	S	1.600000E	01
3.600000E	02	S	1.600000E	01
3.900000E	02	S	1,600000E	01
4.200000E	02	S	1.600000E	01
4.500000E	02	S	1.600000E	01
4.600000E	02	S	7.99999E	00
5.100000E	02	5 S	7.999999E	00
5.400000E	02	S	7,999999E	00
5.700000E	02	S	7.999999E	00
6.000000E	02	S	7.999999E	00
6.300000E	02	S	7.99999E	00
6.6000C0E	02	S	7.999999E	00
6.900000E	02	S	7.999999E	00
7.20JOCCE	02	S	7.999999E	00
7.500000E	02	S	7.99999E	00
7.800000E	02	S	7.9999995	00
8.100000E	02	S	7.999999E	00
8.400000E	ó2	S	7.99999E	00
8.7000CCE	02	S	7.99999E	00
9.000000E	02	S	1.600000E	01
9.300000E	02	S	1.600000E	01

TIME 0.0 3.000000E 6.000000E 9.000000E 1.200000E 1.500000E 2.100000E 2.400000E 2.700000E	01 01 01 02 02 02 02 02 02	TYPE 555555555555555555555555555555555555	VALUE 7.999998E 00
3.000000E 3.300000E 3.600000E 4.200000E 4.500000E 5.100000E 5.400000E 6.000000E 6.000000E 6.300000E 6.900000E 7.200000E 7.500000E 7.500000E 8.100000E 8.400000E	02 02 02 02 02 02 02 02 02 02 02 02 02 0	<i>ຑຑຑຑຑຑຑຑຑຑຑຑຑຑຑຑຑຑ</i>	7.999998E 00 7.999998E 00 7.999998E 00 7.999998E 00 7.999998E 00 3.99999E 00
8.700000E 9.000000E 9.300000E	02 02 02	s s s	3.999999E 00 7.999998E 00 7.999998E 00

POINT-ID ■ 5

T 1145	T \		1.41.115	
TIME	1 1	PE	VALUE	~ ~
0.0		S	7.999998E	00
	01	S S	7.999998E	00
	01	5	7.99998E	00
	01	S	7.999998E	00
)2	S	7.999998E	00
	22	S	7.99998E	00
	02	S S	7.99998E	00
	02	5	7.999998E	00
	02	S	7.959998E	CO
	02	S	7.999998E	00
	02	S	7.999998E	00
	D2 D2	5	7.999998E	00
	02	S S S S S	7.999998E 7.999998E	00
	02	3	7.999998E	00
	02	3		00
	02	5	7.999998E 3.999999E	00
	02	5	3.999999E	00
	02	5	3.999999E	00
	02	3	3.999999E	00
	02	2	3.999999E	00
	02	5 5 5 5 5 5 5 5 5	3.999999E	00
	02	2	3.999999E	CO
	02	2	3.999999E	00
	02	5		00
	02	S S	3.999999E 3.999999E	00
	02 02	S	3.99999E	00
	02 02			
	02 02	S S	3.999999E 3.999999E	00
	02 02	o c	3.999999E	00
		S		
	02	S	7.999998E	00
9.300000E	02	5	7.999998E	00

POINT-ID = 6

TIME		TYPE	VALUE
0.0		S	1,600000E 01
3.000000E	01	S	1.500000E 01
6.000000E	01	s	1.600000E 01
9.000000E	01	S	1.600000E 01
1.200000E	02	s	1.600000E 01
1.500000E	02	S	1.600000E 01
1.60J000E	02	Š	1.600000E 01
2.100000E	02	Š	1,600000E 01
2.400000E	02	555555555555555555555555555555555555555	1.600000E 01
2.70000CE	02	Š	1.600000E 01
3.000000E	02	S	1.6C0000E 01
3.300000E	02	s	1.600000E 01
3.600000E	02	S	1.600000E 01
3.900000E	02	S	1.600000E 01
4.200000E	02	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	1.600000E 01
4.500000E	02	s	1.600000E 01
4.S00000E	02	S	7.99999E 00
5.100000E	02	S	7.999999E 00
5.400000E	02	S	7.999999E 00
5.700000E	02	S	7.999999E 00
6.000000E	02	S	7.999999E 00
6.300000E	02	S	7.999999E 00
6.600000E	02	S	7.99999E 00
6.900000E	02	S	7.999999E 00
7.200000E	02	s s s	7.999999E CO
7.500000E	02	S	7.99999E 00
7.800,000E	02	S	7.99999E 00
8.100000E	02	\$ \$ \$	7.999999E 00
8.40000GE	Ő2	S	7.99999E 00
8.700000E	02	S	7.999999E 00
9.000000E	02	S S	1.600000E 01
9.300000E	02	S	1.600000E 01

POINT-ID = 7

TIME	TYPE	VALUE	
0.0	S S	1.600000E	01
3.000000E 01		1.600000E	01
6.000000E 01	s	1.60000E	01
9.000000E 01	S	1.600000E	01
1.200000E 02		1.600000E	01
1.5000COE 02	5	1.600000E	01
1.600000E 02	5	1.600000E	01
2.100000E 02		1.600000E	01
2.400000E 02		1.600000E	01
2.700000E 02	5	1.60000E	01
3.000000E 02		1.600000E	01
3.300000E 02		1.600000E	01
3.600000E 02		1.600000E	01
3.900000E 02		1.6C0000E	01
4.200000E 02		1.600000E	01
4.500000E U2		1.600000E	01
4.800000E 02 5.100000E 02		7.99999E	00
		7.99999E	00
5.400000E 02 5.7000C0E 02		7.999999E	00
	: 5	7.999999E	00
		7.999999E	00
6.3000COE 02		7.999999E	00
6.6000COE 02	2 5	7.999999E	00
6.900000E 02	2 5	7.99999E	00
7.200000E 02		7.999999E	00
7.500000E 02		7.999999E	00
		7.999999E	00
8.1000CCE 03		7.95999E	00
8.400000E 02		7.999999E 7.999999E	00
		7.999999E 1.600000E	_
			01
9.300000E 0	2 S	1.600000E	01

POINT-ID = 8

TIME		TYPE	VALUE	
0.0		S	7.99998E	00
3.000000E	01	S	7.99998E	00
6.000000E	01	S	7.99998E	00
9.000000E	01	S	7.999998E	00
1.200000E	02	S	7.999998E	00
1.500000E	02	S	7.999998E	00
1.800000E	02	S	7.999998E	00
2.100000E	02	S	7.999998E	00
2.400000E	02	S	7.999998E	00
2.700000E	02	S	7.999998E	00
3.000000E	02		7.999998E	00
3.300000E	02	S S	7.999998E	00
3:6000Q0E	02	S	7.999998E	00
3.900000E	02	S	7.999998E	00
4.20000ÒE	02	S	7.999938E	00
4.500000E	02	5	7.999998E	00
4.600000E	02	S	3.99999E	00
.5.1000COE	02	S	3.99999E	00
5.4000CQE	02	S	3.999999E	00
5.700000E	02	S	3.99999E	00
6.000000E	02	5	3.999999E	00
6.300000E	02	S	3.99999E	00
6.600000E	02	S	3.999999E	00
6.90000E	02	S	3.99999E	00
7.200000E	02	S	3.99999E	00
7.500000E	02	5	3.999999E	00
7.800000E	02	S	3.99999E	00
8.100000E	02	S	3.99999E	00
8.400000E	02	5	3.99999E	00
8.700000E	02	Ş	3.99999E	00
9.000000E	02	S	7.999998E	00
9.300000E	02	S	7.999998E	00

S

S

S

S

S

S

S

2.999998E 07

2.999998E 07

2.999998E 07

2.9939988 07

2.9999988 07

2.999998E 07

2.999998E 07

2.999998E 07

100

POINT-ID =

7.200000E 02

7.50000CE 02

7.80000GE 02

8.1000CGE 02

8.4C00C0E 02

8.700000E 02

9.000000E 02

9.3000COE 02

XY-OUTPUT SUMMARY

SUBCASE RESPONSE

DISPLACEMENT CUEVE

1(3)

CURVE TITLE =

X-AXIS TITLE =TIME IN SECONDS

Y-AXIS TITLE = DEGREES CELSIUS GP(100,1,4)

THE FOLLOWING INFORMATION IS FOR THE ABOVE DEFINED CURVE ONLY.

WITHIN THE FRAME X-LIMITS (X = 0.0

TO X = 0.9300000E 03)

THE SMALLEST Y-VALUE = 0.2766606E 03 AT X = 0.8700000E 03

THE LARGEST Y-VALUE = $0.30000000E \ O3 \ AT \ X = 0.0$

WITHIN THE X-LIMITS OF ALL DATA (X = 0.0 TO X = 0.9300000E 03)

THE SMALLEST Y-VALUE = 0.2766606E 03 AT X = 0.8700000E 03

THE LARGEST Y-VALUE = 0.30000000E 03 AT X = 0.0

PAGE

XY-OUTPUT SUMMARY

SUBCASE RESPONSE

DISPLACEMENT CUFVE

4(3)

CURVE TITLE =

X-AXIS TITLE =TIME IN SECONDS

Y-AXIS TITLE = DEGFEES CELSIUS GP(100,1,4)

THE FOLLOWING INFORMATION IS FOR THE ABOVE DEFINED CURVE ONLY.

WITHIN THE FRAME X-LIMITS (X = 0.0 TO X = 0.9300000E 03)

THE SMALLEST Y-VALUE = 0.2126197E 03 AT X = 0.8700000E 03

WITHIN THE X-LIMITS, OF ALL DATA (X = 0.0 TO X = 0.9300000E 03)

THE SMALLEST Y-VALUE = 0.2126197E 03 AT X = 0.8700000E 03

XY-OUTPUT SUMMARY

SUBCASE RESPONSE DISPLACEMENT

CUF:VE 100(3)

CURVE TITLE = X-AXIS TITLE =TIME IN SECONDS

Y-AXIS TITLE = DEGREES CELSIUS GP(100,1,4)

THE FOLLOWING INFORMATION IS FOR THE ABOVE DEFINED CURVE ONLY.

WITHIN THE FRAME X-LIMITS (X = 0.0 TO X = 0.93000000E 03)

THE SMALLEST Y-VALUE = 0.2999978E 03 AT X = 0.5100000E 03

THE LARGEST Y-VALUE = 0.30000000E 03 AT X = 0.0.

WITHIN THE X-LIMITS OF ALL DATA (X = 0.0 TO X = 0.9300000E 03)

THE SMALLEST Y-VALUE = 0.2997978E 03 AT X = 0.5100000E 03

THE LARGEST Y-VALUE = 0.3000000E 03 AT X = 0.0

JANUARY 1, 1976 NASTRAN 12/31/74

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XY-OUTPUT SUMMARY

SUBCASE RESPONSE

VELOCITY CUEVE 100(3)

CURVE TITLE =

X-AXIS TITLE =TIME IN SECONDS

Y-AXIS TITLE = DEGFEES CELSIUS PER SECOND GP(100.1.4)

THE FOLLOWING INFORMATION IS FOR THE ABOVE DEFINED CURVE ONLY.

WITHIN THE FRAME X-LIMITS (X = 0.0

TO X = 0.9300000E 03)

THE SMALLEST Y-VALUE = -0.4069009E-C4 AT X = 0.0

THE LARGEST Y-VALUE = 0.3255208E-04 AT X = 0.3000000E 02

WITHIN THE X-LIMITS OF ALL DATA (X = 0.0

TO X = 0.930G000E 03)

THE SMALLEST Y-VALUE = -0.4069009E-04 AT X = 0.0

THE LARGEST Y-VALUE = 0.3255208E-04 AT X = 0.3000000E 02

PAGE

XY-OUTPUT SUMMARY

SUBCASE RESPONSE

VELOCITY

CUEVE 1(3)

XY-PAIRS WITHIN FRAME LIMITS WILL BE PLOTTED PENSIZE = 1

THIS IS CURVE 1 CF WHOLE FRAME 1

1

CURVE TITLE =

X-AXIS TITLE =TIME IN SECONDS

Y-AXIS TITLE = DEGREES CELSIUS PER SECOND GP(100.1.4)

THE FOLLOWING INFORMATION IS FOR THE ABOVE DEFINED CURVE ONLY.

WITHIN THE FRAME X-LIMITS (X = 0.0 TO X = 0.9300000E 03)

THE SMALLEST Y-VALUE = -0.6912434E-01 AT X = 0.3000000E 02

THE LARGEST Y-VALUE = 0.8007810E-02 AT X = 0.9000000E 03

WITHIN THE X-LIMITS OF ALL DATA (X = 0.0

 $TO X = 0.9^{\circ}00000E 03)$

THE SMALLEST Y-VALUE = -0.6912434E-01 AT X = 0.3000000E 02

THE LARGEST Y-VALUE = 0.8007810E-02 AT X = 0.9000000E 03

END OF SUMMARY

PAGE

XY-'OUTPUT SUMMARY

SUBCASE

RESPONSE VELOCITY

CUEVE

4(3)

XY-PAIRS WITHIN FRAME LIMITS WILL BE PLOTTED

PENSIZE = 1

THIS IS CURVE 1 OF WHOLE FRAME 2

CURVE TITLE =

X-AXIS TITLE =TIME IN SECONDS

Y-AXIS TITLE = DEGREES CELSIUS PER SECOND GP(100.1.4)

THE FOLLOWING INFORMATION IS FOR THE ABOVE DEFINED CURVE ONLY.

WITHIN THE FRAME X-LIMITS (X = 0.0 TO X = 0.9300000E 03)

THE SMALLEST Y-VALUE = -0.2841634E 00 AT X = 0.3000000E 02

THE LARGEST Y-VALUE = 0.3864440E-C1 AT X = 0.9000000E 03

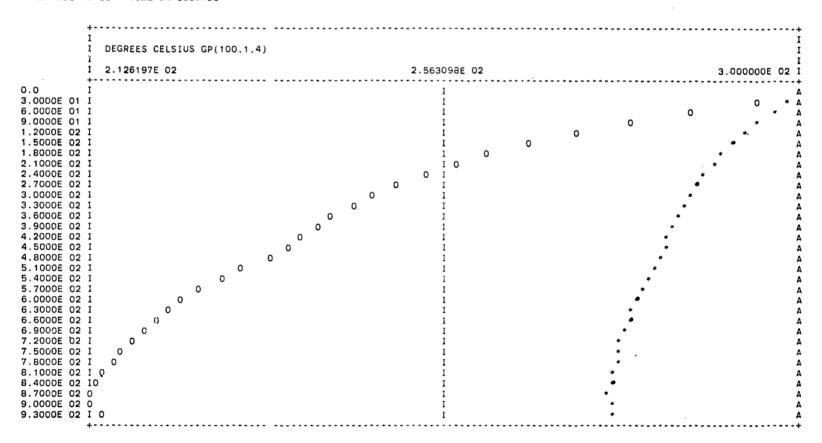
WITHIN THE X-LIMITS OF ALL DATA (X = 0.0

TO X = 0.9300000E 03)

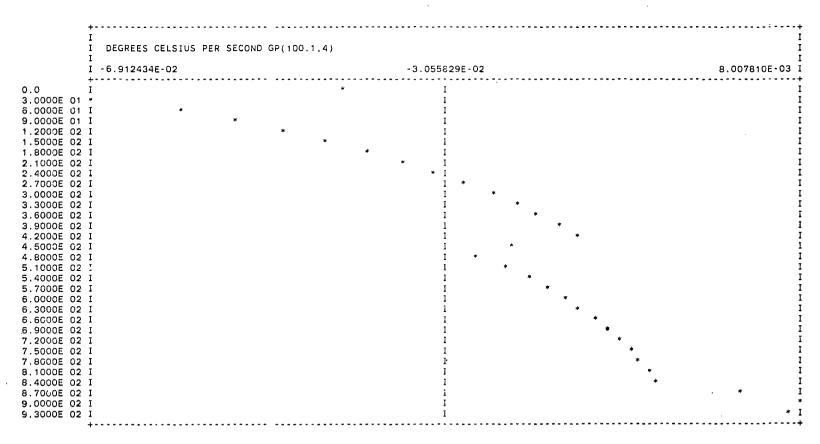
THE SMALLEST Y-VALUE = -0.2841634E 00 AT X = 0.3000000E 02

THE LARGEST Y-VALUE = 0.3864440E-01 AT X = 0.9000000E 03





	I I DEGREES CELSIUS PER SECOND GP(100,1,4)		
	I -4.069009E-05	-4.069007E-06	3.255208E-05 I
C.0	,	I	Ī
3.0000E 01		<u>I</u>	*
6.0000E 01		1	* 1
1.2000E 02		Î	Ĩ
1,5000E 02		I	*
1.8000E 02		I.	Ţ.
2.1000E 02 2.4000E 02		I T	* [
2.7000E 02		Ī	* 1
3.0000E 02		ī	Ī
3.3000E 02		1	* I
3.6000E 02		* I	I .
3.9000E 02 4.2000E 02		i *	1
4.5000E 02		I *	i
4.8000E 02		Ī	Ī
5.1000E 02		I	* I
5.4000E 02		I	1
5.7000E 02 6.0000E 02		1 * 1	* 1
6.3000E 02			İ
6.6000E 02		ī *	Ī
6.9000E 02		1 *	I
7.2000E 02		<u> </u>	Ţ
7.5000E 02 7.8000E 02		i *	· 1
8.1000E 02		1 *	i
8.4000E 02		- 1 *	Ĭ
8.7000E 02	I	1 *	1
9.0000E 02		I *	Ī
9.3000E 02	1	1 *	I



I	DEGREES CELSIUS PER SECOND GP(100		
:	-2.841634E-01	-1.227595E-01	3.864440E-02
i i		* I	
0000E 01 *		I ,	
0000E 01 I	*	1	
0000E 01 I	· · · · · · · · · · · · · · · · · · ·	<u>,</u>	
2000E 02 I	•		
5000E 02 I		, I	
8000E 02 I 1000E 02 I		"	
4000E 02 I		'	
7000E 02 I		1 *	
0000E 02 I		τ *	
3000E 02 I		T	
6000E 02 I		Ţ *	
9000E 02 I		Ī *	
2000E 02 I		*	
5000E 02 I		Ĭ *	
8000E 02 I		1 *	
1000E 02 I		I *	
4000E 02 I		I *	
7000E 02 I		I *	
COOOE 02 I		1 *	
3000E 02 I		1	
60C0E 02 I		I *	
9000E 02 I		I *	
2000E 02 1		<u> </u>	
5000E 02 1		<u>I</u>	*
8000E 02 1		I .	*
1000E 02 1		1.	*
4000E 02 1		I.	
7000E 02 1		1	•
0000E 02 1		1	

```
NASTRAN LOADED AT LOCATION 1A2720
TIME TO GO = 599 CPU SEC., 599 I/O SEC.
     O CPU-SEC.
                        O ELAPSED-SEC.
                                            SEM1
                                                  BEGN
     O CPU-SEC.
                        O ELAPSED-SEC.
                                            SEMT
     1 CPU-SEC.
                        4 ELAPSED-SEC.
                                            NAST
     1 CPU-SEC.
                        4 ELAPSED-SEC.
                                            GNFI
     1 CPU-SEC.
                        5 ELAPSED-SEC.
                                            XCSA
                                            IFP1
     1 CPU-SEC.
                        7 ELAPSED-SEC.
     1 CPU-SEC.
                                            XSOR
                       10 ELAPSED-SEC.
     2 CPU-SEC.
                       15 ELAPSED-SEC.
                                              DO
                                                  IFP
     3 CPU-SEC.
                                             END
                                                 IFP
                       29 ELAPSED-SEC.
     3 CPU-SEC.
                       29 ELAPSED-SEC.
                                            XGPI
     5 CPU-SEC.
                       34 ELAPSED-SEC.
                                            SEM1
                                                  END
     5 CPU-SEC.
                       35 ELAPSED-SEC.
                                            ----
                                                  LINKNSO2 ---
    26 I/O SEC.
LAST LINK DID NOT USE
                       40016 BYTES OF OPEN CORE
     5 CPU-SEC.
                       37 ELAPSED-SEC.
                                            ---
                                                  LINK END ---
     5 CPU-SEC.
                       37 ELAPSED-SEC.
                                            XSFA
     5 CPU-SEC.
                       38 ELAPSED-SEC.
                                            XSFA
                                            3
                                                           BEGN
     5 CPU-SEC.
                       IB ELAPSED-SEC.
                                                  GP1
     3 CPU-SEC.
                       45 ELAPSED-SEC.
                                            3
                                                  GP 1
                                                           END
     5 CPU-SEC.
                       4.7 ELAPSED-SEC.
                                            8 .
                                                  GP2
                                                           BEGN
                                            8
                                                  GP2
                                                           END
     5 CPU-SEC.
                       4.8 ELAPSED-SEC.
     5 CPU-SEC.
                       48 ELAPSED-SEC.
                                            10
                                                  PLTSET
                                                           BEGN
     5 CPU-SEC.
                       49 ELAPSED-SEC.
                                            10
                                                  PLTSET
                                                           END
     5 CPU-SEC.
                       50 ELAPSED-SEC.
                                            12
                                                  PRTMSG
                                                           BEGN
     5 CPU-SEC.
                       50 ELAPSED-SEC.
                                            12
                                                  PRTMSG
                                                           END
                                                           BEGN
     5 CPU-SEC.
                       51 ELAPSED-SEC.
                                            13
                                                  SETVAL
                                                  SETVAL END
     5 CPU-SEC.
                       51 ELAPSED-SEC.
                                            13
                                            21
                                                           BEGN
     5 CPU-SEC.
                       52 ELAPSED-SEC.
                                                  GP3
                                            21
                                                  GP3
                                                           END
     5 CPU-SEC.
                       59 ELAPSED-SEC.
     5 CPU-SEC.
                       59 ELAPSED-SEC.
                                            23
                                                  TA1
                                                           BEGN
                                            23
                                                  TA1
                                                           END
     6 CPU-SEC.
                       67 ELAPSED-SEC.
                                                  LINKN503 ---
     6 CPU-SEC.
                       68 ELAPSED-SEC.
    57 I/O SEC.
LAST LINK DID NOT USE 82788 BYTES OF OPEN CORE
     6 CPU-SEC.
                       71 ELAPSED-SEC.
                                            ---- LINK END ---
                                            27
                                                  SMA1
                                                           BEGN
     6 CPU-SEC.
                       71 ELAPSED-SEC.
                                                           END
                                            27
                                                  SMA1
     6 CPU-SEC.
                       74 ELAPSED-SEC.
     6 CPU-SEC.
                       74 ELAPSED-SEC.
                                            30
                                                  SMA2
                                                           BEGN
                                                  SMA2
                                                           END
     6 CPU-SEC.
                       "8 ELAPSED-SEC.
                                                  LINKNSO5 ---
     6 CPU-SEC.
                       79 ELAPSED-SEC.
    65 I/O SEC.
LAST LINK DID NOT USE 64268 BYTES OF OPEN CORE
     6 CPU-SEC.
                       82 ELAPSED-SEC.
                                                 LINK END ---
     6 CPU-SEC.
                       82 ELAPSED-SEC.
                                            35
                                                  RMG
                                                           BEGN
     6 CPU-SEC.
                       86 ELAPSED-SEC.
                                            SDCO
                                                 MP
                       86 ELAPSED-SEC.
                                            SDCO
                                                  MP
     6 CPU-SEC.
     6 CPU-SEC.
                       87 ELAPSED-SEC.
                                            FBS
     6 CPU-SEC.
                                            FBS
                       89 ELAPSED-SEC.
     6 CPU-SEC.
                       90 ELAPSED-SEC.
                                            MPYA
                                                  D
                                                  METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                            MPYA
     7. CPU-SEC.
                       91 ELAPSED-SEC.
                                                  D
     7 CPU-SEC.
                       91 ELAPSED-SEC.
                                            TRAN POSE
     7 CPU-SEC.
                       92 ELAPSED-SEC.
                                            TRAN POSE
     7 CPU-SEC.
                       92 ELAPSED-SEC:
                                            MPYA
                                                  D
```

```
0.0
                                                METHOD 2 NT.NER PASSES = 1.EST. TIME =
                                          MPYA D
                      93 ELAPSED-SEC.
     7 CPU-SEC.
                                          35
     7 CPU-SEC.
                      95 ELAPSED-SEC.
                                               RMG
                                                        END
                                          ---- LINKNSO4 ---
    7 CPU-SEC.
                      97 ELAPSED-SEC.
    82 I/O SEC.
LAST LINK DID NOT USE 72520 BYTES OF OPEN CORE
     7 CPU-SEC.
                   101 ELAPSED-SEC.
                                       ---- LINK END ---
     7 CPU-SEC.
                     'C1 ELAPSED-SEC.
                                          40
                                                GP4
                                                        BEGN
                                                GP4
                                                        END
     7 CPU-SEC.
                     104 ELAPSED-SEC.
                                          40
                                                GPSP
     7 CPU-SEC.
                     1(6 ELAPSED-SEC.
                                          46
                                                        BEGN
     7 CPU-SEC.
                     : (6 ELAPSED-SEC.
                                          46
                                                GPSP
                                                        END
                     :C7 ELAPSED-SEC.
                                          ----
                                               LINKNS14 ---
     7 CPU-SEC.
    90 I/O SEC.
LAST LINK DID NOT USE 117044 BYTES OF OPEN CORE
     7 CPU-SEC.
                     110 ELAPSED-SEC.
                                         ---- LINK END ---
     7 CPU-SEC.
                     110 ELAPSED-SEC.
                                          47
                                               OFP
                                          47
                                                OFP
                                                        END
     7 CPU-SEC.
                     1:1 ELAPSED-SEC.
                                          ---- LINKNSO4 ---
     7 CPU-SEC.
                     .13 ELAPSED-SEC.
    93 I/O SEC.
LAST LINK DID NOT USE 115664 BYTES OF OPEN CORE
     B CPU-SEC.
                     116 ELAPSED-SEC.
                                          ---- LINK END ---
     3 CPU-SEC.
                     116 ELAPSED-SEC.
                                          51
                                               MCE 1
                                                        BEGN
                     119 ELAPSED-SEC.
                                          51
                                                MCE1
                                                        END
     3 CPU-SEC.
     3 CPU-SEC.
                     119 ELAPSED-SEC.
                                          53
                                                MCE2
                                                        BEGN
     3 CPU-SEC.
                     121 ELAPSED-SEC.
                                          MPYA D
                                                METHOD 2 NT, NBR PASSES = 1, EST. TIME =
                                                                                              0.0
     8 CPU-SEC.
                     123 ELAPSED-SEC.
                                          MPYA D
     8 CPU-SEC.
                     123 ELAPSED-SEC.
                                          MPYA D
                                                METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                              0.0
     8 CPU-SEC.
                     124 ELAPSED-SEC.
                                          MPYA
     8 CPU-SEC.
                     124 ELAPSED-SEC.
                                          MPYA D
                                                METHOD 2 T ,NBR PASSES = 1.EST. TIME =
                                                                                              0.0
                                          MPYA D
     9 CPU-SEC.
                     126 ELAPSED-SEC.
     9 CPU-SEC.
                     128 ELAPSED-SEC.
                                          MPYA D
                                                METHOD 2 NT, NBR PASSES = 1, EST. TIME =
                                                                                              0.0
                                          MPYA D
     9 CPU-SEC.
                     150 FLAPSED-SEC.
                                          MPYA D
     3 CPU-SEC.
                     130 ELAPSED-SEC.
                                                METHOD 2 T , NBR PASSES = 1.EST. TIME =
                                                                                              0.0
     3 CPU-SEC.
                     131 ELAPSED-SEC.
                                          MPYA D
     ∃ CPU-SEC.
                     131 ELAPSED-SEC.
                                          MPYA D
                                                METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                              0.0
                                          MPYA D
     10 CPU-SEC.
                     132 ELAPSED-SEC.
     10 CPU-SEC.
                                          MPYA D
                     134 ELAPSED-SEC.
                                                METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                              0.0
     10 CPU-SEC.
                     136 ELAPSED-SEC.
                                          MPYA D
     10 CPU-SEC.
                     136 ELAPSED-SEC
                                          MPYA D
                                                                                              0.0
                                                METHOD 2 T .NBR PASSES = 1.EST. TIME =
     10 CPU-SEC.
                     137 ELAPSED-SEC.
                                          MPYA D
     10 CPU-SEC.
                     138 ELAPSED-SEC.
                                          MPYA
                                                METHOD 2 T .NBR PASSES = 1,EST. TIME ■
                                                                                              0.0
     10 CPU-SEC.
                     139 ELAPSED-SEC.
                                          MPYA D
     11 CPU-SEC.
                      139 ELAPSED-SEC.
                                           53
                                                MCE2
                                                        END
     11 CPU-SEC.
                      141 ELAPSED-SEC.
                                          XSFA
     11 CPU-SEC.
                     142 ELAPSED-SEC.
                                           XSFA
     11 CPU-SEC.
                                           ---- LINKNSO6 ---
                     142 ELAPSED-SEC.
= 116 I/O SEC.
LAST LINK DID NOT USE 102132 BYTES OF OPEN CORE
    11 CPU-SEC.
                     144 ELAPSED-SEC.
                                          ---- LINK END ---
     11 CPU-SEC.
                     144 ELAPSED-SEC.
                                           75
                                                DPD
                                                         BEGN
     11 CPU-SEC.
                                                DPD
                     152 ELAPSED-SEC.
                                          75
                                                        END
    11 CPU-5.50.
                     155 ELAPSED-SEC.
                                          ---- LINKNS10 ---
= 126 I/O SEC.
LAST LINK DID NOT USE 109192 SYTES OF OPEN CORE
    11 CPU-SEC.
                     158 ELAPSED-SEC.
                                         ---- LINK END ---
```

```
11 CPU-SEC.
                     159 FLAPSED-SEC
                                                 MIRXIN
                                                         REGN
                                           81
    11 CPU-SEC
                     139 ELAPSED-SEC.
                                           81
                                                 MIRXIN
                                                         END
    11 CPU-SEC.
                     160 ELAPSED-SEC.
                                           B?
                                                 PARAM
                                                         BECN
    11 CPU-SEC.
                     160 ELAPSED-SEC
                                                 PARAM
                                                         FIND
                                           83
    11 CPU-SEC
                     161 FLAPSED-SEC.
                                           XSFA
    11 CPU-SEC.
                     162 FLAPSED-SEC.
                                           XSEA
    11 CPU-SEC.
                     162 ELAPSED-SEC.
                                           88
                                                 GKAD
                                                         REGN
    11 CPU-SEC.
                     165 ELAPSED-SEC.
                                           88
                                                 GKAD
                                                         END
    11 CPU-SEC.
                     165 FLAPSED-SEC.
                                           XSFA
    12 CPU-SEC.
                     167 ELAPSED-SEC.
                                           XSFA
                                                 LINKNSO5 ---
    12 CPU-SEC.
                     167 FLAPSED-SEC.
                                           ----
   133 I/O SEC.
LAST LINK DID NOT USE 109852 BYTES OF OPEN CORE
    12 CPU-SEC.
                                           ---- LINK FND ---
                     168 ELAPSED-SEC.
    12 CPU-SEC.
                     168 FLAPSED-SEC.
                                           92
                                                 TRIG
                                                         BEGN
    12 CPU-SEC.
                     178 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 T .NBR PASSES =
                                                                            1.EST. TIME ±
                                                                                                0.0
    12 CPU-SEC.
                     179 ELAPSED-SEC.
                                           MPYA D
    12 CPU-SEC.
                     180 ELAPSED-SEC.
                                           MPYA D
                                                                            1 EST TIME =
                                                 METHOD 2 NT.NBR PASSES =
                                                                                                0.0
    12 CPU-SEC.
                     181 ELAPSED-SEC.
                                           MPYA
                                                 D
    13 CPU-SEC.
                     181 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 NT.NBR PASSES =
                                                                            1.EST. TIMF =
                                                                                                0.0
    13 CPU-SEC.
                     182 ELAPSED-SEC.
                                           MPYA D
    13 CPU-SEC.
                     183 ELAPSED-SEC.
                                           MPYA
                                                 ח
                                                 METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                0.0
    13 CPU-SEC.
                     184 ELAPSED-SEC.
                                           MPYA D
    13 CPU-SEC.
                     184 ELAPSED-SEC.
                                           92
                                                 TRLG
                                                         END
    13 CPU-SEC.
                     184 ELAPSED-SEC.
                                           ---- LINKNS11 ~
   149 I/O SEC.
LAST LINK DID NOT USE 58156 BYTES OF OPEN CORE
    13 CPU-SEC.
                     187 ELAPSED-SEC.
                                          ---- LINK END ---
   13 CFU-SEC.
                     187 ELAPSED-SEC.
                                           97
                                                 TRHT
                                                         BEGN
    13 CPU-SEC.
                     190 ELAPSED-SEC.
                                           DECO MP
                                                MP
    13 CPU-SEC.
                     192 ELAPSED-SEC.
                                           DECO
    15 CPU-SEC.
                      222 ELAPSED-SEC.
                                           97
                                                 TRHT
                                                         END
    15 CPU-SEC.
                     223 ELAPSED-SEC.
                                                 LINKNS12 ---
                                           ----
   195 I/O SEC.
LAST LINK DID NOT USE 69268 BYTES OF OPEN CORE
    15 CPU-SEC.
                     228 ELAPSED-SEC.
                                          ---- LINK END ---
    15 CPU-SEC.
                     228 ELAPSED-SEC.
                                           99
                                                 VDR
                                                         BEGN
    15 CPU-SEC.
                     229 ELAFSED-SEC.
                                           99
                                                 VDR
                                                         END
    15 CPU-SEC.
                     229 ELAPSED-SEC.
                                           111
                                                 PARAM
                                                         BEGN
    15 CPU-SEC.
                     229 ELAPSED-SEC.
                                           111
                                                 PARAM
                                                         END
    15 CPU-SEC.
                     230 ELAPSEU-SEC.
                                           115
                                                 SDR1
                                                         BEGN
    15 CPU-SEC.
                     230 ELAPSED-SEC.
                                           MPYA
                                                 n
                                                 METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                0.0
    15 CPU-SEC.
                                           MPYA
                                                 D
                     231 ELAPSED-SEC.
    16 CPU-SEC.
                     234 ELAPSED-SEC.
                                           115
                                                 SDR1
    16 CPU-SEC.
                     234 ELAPSED-SEC.
                                                 LINKNSOB ---
   205 I/O SEC.
LAST LINK DID NOT USE 119104 BYTES OF OPEN CORE
    15 CPU-SEC.
                     241 ELAPSED-SEC.
                                           ----
                                                 LINK END ---
                                           118 PLTTRAN BEGN
    16 CPU-SEC.
                     241 ELAPSED-SEC.
    16 CPU-SEC.
                     242 ELAPSED-SEC.
                                                 PLTTRAN END
                                           118
    16 CPU-SEC.
                     242 ELAPSED-SEC.
                                           XSFA
    16 CPU-SEC.
                     244 ELAPSED-SEC.
                                           XSFA
    16 CPU-SEC.
                     244 ELAPSED-SEC.
                                           ----
                                                 LINKNS13 ---
   208 I/c SEC.
LAST LINK DID NOT USE 100596 BYTES OF OPEN CORE
                                          -:-- LINK END ---
    16 CAL SEC.
                     245 ELAFSED-SEC.
                                                 SDR2
                                                         BEGN
    16 CPU-SEC.
                     245 ELAPSED-SEC.
                                           120
    16 CPU-SEC.
                     250 ELAPSED-SEC.
                                                 SDR2
                                                         END
```

---- LINKNS14 ---

16 CPU-SEC.

250 ELAPSED-SEC.

```
= 216 I/O SEC.
LAST LINK DID NOT USE 66428 BYTES OF OPEN CORE
    16 CPU-SEC.
                    254 ELAPSED-SEC.
                                      ---- LINK END ---
    16 CPU-SEC.
                    255 ELAPSED-SEC.
                                        120 GFP
                                                     BEGN
    17 CPU-SEC.
                    258 ELAPSED-SEC.
                                        120 OFP
                                                      END
    17 CPU-SEC.
                    258 ELAPSED-SEC.
                                        121 · SDR3
                                                      BEGN
    17 CPU-SEC.
                    264 ELAPSED-SEC.
                                        121
                                              SDR3
                                                      END
    17 CPU-SEC.
                    264 ELAPSED-SEC.
                                        123
                                              OFP
                                                      BEGN
    18 CPU-SEC.
                    268 ELAPSED-SEC.
                                        123
                                              OFP
                                                      END'
    18 CPU-SEC.
                    269 ELAPSED-SEC.
                                        130
                                              XYTRAN BEGN
    20 CPU-SEC.
                    277 ELAPSED-SEC.
                                        130 XYTRAN END
    20 CPU-SEC.
                    277 ELAPSED-SEC.
                                        ---- LINKNSO2 ---
   235 I/O SEC.
LAST LINK DID NOT USE
                          O BYTES OF OPEN CORE
    20 CPU-SEC.
                    285 ELAPSED-SEC.
                                      ---- LINK END ---
    20 CPU-SEC.
                     285 ELAPSED-SEC.
                                        132 XYPLOT BEGN
    20 CPU-SEC.
                     285 ELAPSED-SEC.
                                        132 XYPLOT END
    20 CPU-SEC.
                     285 ELAPSED-SEC.
                                        138 EXIT
                                                      BEGN
= 236 I/O SEC.
```

LAST LINK DID NOT USE 97232 BYTES OF OPEN CORE AMOUNT OF OPEN CORE NOT USED = OK BYTES

```
TITLE
                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
SUBTITLE =
                  AND TEMPERATURE CARDS PUNCHED.
LABEL
DISPLACEMENTS
REAL OUTPUT
SUBCASE ID =
TIME = 0.0
                                                                              10
TEMP*
                                            3,000000E 02
                                                                              11
                                       1
TEMP*
                                            3.000000E 02
                                                                              12
TEMP*
                                       3
                                            3,000000E 02
                                                                              13
TEMP*
                                            3.000000E 02
                                                                              14
TEMP*
                                            3.000000E 02
                                                                              15
TEMP*
                                            3.000000E 02
                                                                              16
                                       7
                                            3.0000COE 02
TEMP*
                                                                              17
TEMP*
                                       8
                                            3.000000E 02
                                                                              18
                                            3.000000E 02
TEMP*
                                       9
                                                                              19
TEMP*
                                      10
                                            3.000000E 02
TEMP*
                                     100
                                            3.000000E 02
                                                                              21
                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
TITLE
D
                                                                              23
SUBTITLE =
                  AND TEMPERATURE CARDS PUNCHED.
                                                                              24
                                                                              25
LABEL =
                                                                              26
                                                                              27
DISPLACEMENTS
                                                                              28
REAL OUTPUT
                                                                              29
SUBCASE ID =
                                                                              30
TIME = 0.3000000E 02
                                                                              31
TEMP*
                                       1 2.987498E 02
                                                                              32
TEMP*
                                            2.978250E 02
                                                                              33
TEMP*
                                            2.952100E 02
                                                                              34
TEMP*
                                                                              35
                                            2.949839E 02
TEMP*
                                            2.987498E 02
                                                                              36
TEMP*
                                            2.978252E 02
                                                                              37
TEMP*
                                            2.952102E 02
                                                                              38
TEMP*
                                       8
                                            2.949839E 02
                                                                              39
                                            2.987498E 02
TEMP*
                                       9
TEMP*
                                      10
                                            2.987498E 02
                                                                              41
TEMP*
                                     100
                                            2.999988E 02
                                                                              42
TITLE
                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
                                                                              44
                                                                              45
SUBTITLE =
                  AND TEMPERATURE CARDS PUNCHED.
                                                                              46
LABEL
                                                                              47
                                                                              48
DISPLACEMENTS
                                                                              49
REAL OUTPUT
                                                                              50
SUBCASE ID =
                                                                              51
TIME = 0.6000000E 02
                                                                              52
TEMP*
                                         2.966760E 02
                                                                              53
TEMP*
                                            2.939788E 02
                                                                              54
TEMP*
                                            2.873252E 02
TEMP*
                                            2.864590E 02
                                                                              56
TEMP*
                                            2.966760E 02
                                                                              57
TEMP*
                                            2.939790E 02
                                                                              58
TEMP*
                                            2.873254E 02
                                                                              59
TEMP*
                                            2.864590E 02
                                                                              60
TEMP*
                                            2.966760E 02
                                                                              61
                                       9
                                            2.9667605 02
*TEMP*
                                      10
                                            2.99998E 02
TEMP*
                                     100
```

NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE

TITLE

```
65
SUBTITLE =
                  AND TEMPERATURE CARDS PUNCHED.
                                                                                 66
                                                                                 67
LABEL
                                                                                 68
                                                                                 69
DISPLACEMENTS
                                                                                 70
                                                                                 71
REAL OUTPUT
SUBCASE ID =
                                                                                 72
         0.9000000E 02
                                                                                 73
TIME =
                                              2.948879E 02
                                                                                 74
TEMP*
                                              2.903755E 02
                                                                                 75
TEMP*
TEMP .
                                         3
                                              2.806938E 02
                                                                                 76
TEMP*
                                              2.789768E 02
                                                                                 77
TEMP*
                                         5
                                              2.948879E 02
                                                                                 78
                                              2.903755E 02
                                                                                 79
                                         6
TEMP*
TEMP*
                                         7
                                              2.806941E 02
                                                                                 80
TEMP*
                                         8
                                              2.789768E 02
                                                                                 81
TEMP*
                                         9
                                              2.948879E 02
                                                                                 82
                                              2.948879E 02
                                                                                 83
TEMP*
                                        10
TEMP~
                                       100
                                              2.999988E 02
                                                                                 84
                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
TITLE
                                                                                 85
D
                                                                                  86
SUBTITLE =
                   AND TEMPERATURE CARDS PUNCHED.
                                                                                  87
                                                                                  88
LABEL
                                                                                 89
                                                                                  90
DISPLACEMENTS
                                                                                  91
REAL OUTPUT
                                                                                  92
SUBCASE ID =
                                                                                  93
TIME = 0.1200000E 03
                                                                                  94
TEMP*
                                              2.932939E 02
                                                                                 95
                                              2.870679E 02
TEMP*
                                                                                  96
TEMP*
                                              2,750024E 02
                                                                                  97
                                         3
TEMP*
                                              2,724622E 02
                                                                                  98
TEMP*
                                              2.932939E 02
                                                                                  99
TEMP*
                                         6
                                              2.870679E 02
                                                                                 100
TEMP*
                                              2,750024E 02
                                                                                 101
TEMP*
                                              2.724622E 02
                                         8
                                                                                 102
TEMP*
                                              2.932939E 02
                                         9
                                                                                 103
TEMP*
                                        10
                                              2.932939E 02
                                                                                 104
TEMP*
                                       100
                                              2.999995E 02
                                                                                 105
TITLE
                 NON-LINEAR TRANSIENT PROBLEM ... CYCLIJAL LOADS APPLIE
                                                                                 106
D
                                                                                 107
SUBTITLE =
                   AND TEMPERATURE CARDS PUNCHED.
                                                                                 108
                                                                                 109
LABEL
                                                                                 110
                                                                                 111
DISPLACEMENTS
                                                                                 112
REAL OUTPUT
                                                                                 113
SUBCASE ID =
                                                                                 114
         0.1500000E 03
TIME =
                                                                                 115
TEMP*
                                              2,918564E 02
                                                                                 116
TEMP*
                                              2.840625E 02
                                                                                 117
TEMP*
                                         3
                                              2.700610E 02
                                                                                 118
TEMP*
                                              2.667942E 02
                                                                                 119
TEMP*
                                              2.918564E 02
                                                                                 120
TEMP~
                                              2.840625E 02
                                         6
                                                                                 121
TEMP*
                                              2.700610E 02
                                                                                 122
TEMP*
                                         В
                                              2.667939E 02
                                                                                 123
                                              2.918564E 02
TEMP*
                                         9
                                                                                 124
TEMP*
                                                                                 125
                                              2.918564E 02
                                        10
TEMP*
                                              2.999983E 02
                                       100
                                                                                 126
TITLE
                 NON-LINEAR TRANSIENT PROBLEM ... CYCLILAL LOADS APPLIE
                                                                                 127
                                                                                 128
```

```
SUBTITLE =
                   AND TEMPERATURE CARDS PUNCHED.
                                                                                129
                                                                                130
LABEL
                                                                                131
                                                                                132
DISPLACEMENTS
                                                                                133
REAL OUTPUT
                                                                                134
SUBCASE ID =
                                                                                135
TIME = 0.1800000E 03
                                                                                136
TEMP*
                                              2.905571E 02
                                                                                137
TEMP*
                                              2.813474E 02
                                                                                138
TEMP*
                                             2.657405E 02
                                                                                139
TEMP*
                                             2.618516E 02
                                                                                140
TEMP*
                                        5
                                             2.905571E 02
                                                                                141
TEMP*
                                             2.813474E 02
                                                                                142
TEMP*
                                              2.657405E 02
                                                                                143
TEMP*
                                             2.618516E 02
                                                                                144
TEMP*
                                        9
                                             2.905571E 02
                                                                                145
TEMP*
                                       10
                                             2.905571E 02
                                                                                146
TEMP*
                                      100
                                             2.999993E 02
                                                                                147
TITLE
                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
                                                                                148
D
                                                                                149
SUBTITLE =
                   AND TEMPERATURE CARDS PUNCHED.
                                                                                150
                                                                                151
LABEL =
                                                                                152
                                                                                153
DISPLACEMENTS
                                                                                154
REAL OUTPUT
                                                                                155
SUBCASE ID =
                                                                                156
TIME = 0.2100000E 03
                                                                                157
TEMP*
                                             2.893835E 02
                                                                                158
TEMP*
                                        2
                                             2.789028E 02
                                                                                159
TEMP*
                                        3
                                             2.619446E 02
                                                                                160
TEMP*
                                             2.575278E 02
                                                                                161
TEMP*
                                             2.893835E 02
                                                                                162
TEMP*
                                             2.789028E 02
                                                                                163
TEMP*
                                        7
                                             2.619446E 02
                                                                                164
TEMP*
                                        8
                                             2.575278E 02
                                                                                165
TEMP*
                                        9
                                             2.893835E 02
                        1
                                                                                166
TEMP*
                                             2.893835E 02
                                       10
                                                                                167
TEMP*
                                             2.999983E 02
                                      100
                                                                                168
                NON-LINEAR TRANSIENT PROBLEM ... CYCLILAL LOADS APPLIE
TITLE
                                                                                169
D
                                                                                170
SUBTITLE =
                  AND TEMPERATURE CARDS PUNCHED.
                                                                                171
                                                                                172
LABEL
                                                                                173
                                                                                174
DISPLACEMENTS
                                                                                175
REAL OUTPUT
                                                                                176
SUBCASE ID =
                                                                                177
TIME = 0.2400000E 03
                                                                                178
TEMP*
                                             2.883252E 02
                                                                                179
TEMP*
                                             2.767068E 02
                                                                                180
TEMP*
                                             2.585981E 02
                                                                                181
TEMP*
                                             2.537332E 02
                                                                               182
TEMP*
                                        5
                                             2.883254E 02
                                                                               183
TEMP*
                                        6
                                             2.767068E 02
                                                                               184
TEMP*
                                        7
                                             2.585984E 02
                                                                               185
TEMP*
                                        8
                                             2.537332E 02
                                                                               186
TEMP*
                                        9
                                             2.883254E 02
                                                                               187
                                             2.883252E 02
TEMP*
                                       10
                                                                               188
TEMP*
                                      100
                                             2.999990E 02
                                                                               189
TITLE
                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
                                                                               190
n
                                                                               191
```

AND TEMPERATURE CARDS PUNCHED.

192

SUBTITLE =

```
LABEL
                                                                                  194
                                                                                  195
DISPLACEMENTS
                                                                                  196
                                                                                  197
REAL OUTPUT
SUBCASE ID =
                                                                                  198
TIME =
         0.2700000E 03
                                                                                  199
TEMP*
                                              2.873728E 02
                                                                                  200
TEMP*
                                              2.747371E 02
                                                                                  201
TEMP*
                                         3
                                              2.556405E 02
                                                                                  202
TEMP*
                                              2.503925E 02
                                                                                  203
TEMP*
                                               2.873730E 02
                                                                                 204
TEMP*
                                         6
                                              2.747371E 02
                                                                                  205
TEMP*
                                              2.556406E 02
                                                                                  206
TEMP*
                                         8
                                              2.503927E 02
                                                                                  207
TEMP*
                                         .9
                                              2.873730E 02
                                                                                  208
TEMP*
                                        10
                                              2.873728E 02
                                                                                  209
TEMP*
                                       100
                                              2.999983E 02
                                                                                  210
                 NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
TITLE
                                                                                  211
D
                                                                                  212
SUBTITLE =
                   AND TEMPERATURE CARDS PUNCHED.
                                                                                  213
                                                                                  214
LABEL
                                                                                  215
                                                                                  216
DISPLACEMENTS
                                                                                  217
REAL OUTPUT
                                                                                  218
SUBCASE ID =
                                                                                  219
TIME =
         0.3000000E 03
                                                                                  220
TEMP *
                                               2.865171E 02
                                                                                  221
TEMP*
                                               2.729722E 02
                                                                                  222
TEMP*
                                         3
                                               2.530206E 02
                                                                                  223
TEMP *
                                               2.474437E 02
                                                                                  224
TEMP*
                                               2.865173E 02
                                                                                  225
TEMP*
                                               2.729724E 02
                                                                                  226
TEMP*
                                               2.530208E 02
                                                                                  227
TEMP*
                                               2.474438E 02
                                                                                  228
TEMP*
                                               2.865173E 02
                                                                                  229
TEMP -
                                        10
                                               2.865171E 02
                                                                                  230
TEMP*
                                        100
                                               2.999990E 02
                                                                                  231
TITLE
                 NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
                                                                                  232
Đ
                                                                                  233
SUBTITLE =
                   AND TEMPERATURE CARDS PUNCHED.
                                                                                  234
                                                                                  235
LABEL
                                                                                  236
                                                                                  237
DISPLACEMENTS
                                                                                  238
REAL OUTPUT
                                                                                  239
SUBCASE ID =
                                                                                  240
          0.3300000E 03
TIME =
                                                                                  241
TEMP*
                                               2.857493E 02
                                                                                  242
TEMP*
                                               2.713923E 02
                                         2
                                                                                  243
TEMP*
                                               2.506960E 02
                                                                                  244
TEMP*
                                               2.448345E 02
                                                                                  245
TEMP*
                                               2.857495E 02
                                                                                  246
TEMP*
                                               2.713923E 02
                                                                                  247
                                         6
TEMP*
                                               2.506961E 02
                                                                                  248
TEMP*
                                               2.448347E 02
                                                                                  249
TEMP*
                                               2.857495E 02
                                         9
                                                                                  250
TEMP+
                                         10
                                               2.857493E 02
                                                                                  251
TEMP*
                                        100
                                               2.999983E 02
                                                                                  252
TITLE
                 NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
                                                                                  253
                                                                                  254
SUBTITLE =
                   AND TEMPERATURE CARDS PUNCHED.
                                                                                  255
```

```
LABEL
                                                                               257
                                                                               258
DISPLACEMENTS
                                                                               259
REAL OUTPUT
                                                                               260
SUBCASE ID =
                                                                               261
TIME =
         0.3600000E Q3
                                                                               262
TEMP*
                                             2.850610E 02
                                                                               263
TEMP*
                                             2.699785E 02
                                                                               264
TEMP*
                                        3
                                             2,486305E J2
                                                                               265
                                             2.425215E 02
TEMP*
                                                                               266
TEMP*
                                        5
                                             2.850613E 02.
                                                                               267
TEMP*
                                        6
                                             2.699788E 02
                                                                               268
TEMP*
                                        7
                                             2.486305E 02
                                                                               269
                                             2.425217E 02
TEMP*
                                        8
                                                                               270
                                        9
                                             2.850613E 02
TEMP*
                        1
                                                                               271
TEMP*
                                       10
                                             2.850610E 02
                                                                               272
                                             2.999988E 02
TEMP*
                                      100
TITLE
                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
                                                                               274
                                                                               275
SUBTITLE =
                  AND TEMPERATURE CARDS PUNCHED.
                                                                               276
                                                                               277
                                                                               278
LABEL
                                                                               279
                                                                               280
DISPLACEMENTS
REAL OUTPUT
                                                                               281
SUBCASE ID =
                                                                               282
TIME =
         0.3900000E 03
                                                                               283
TEMP*
                                           2.844446E 02
                                                                               284
TEMP*
                                             2.687141E 02
                                                                               285
                                        2
TEMP*
                                             2.467929E 02
                                        3
                                                                               286
                                             2.404678E 02
TEMP*
                                                                               287
TEMP*
                                        5
                                             2.844446E 02
                                                                               288
TEMP*
                                        6
                                             2.687141E 02
                                                                               289
TEMP*
                                        7
                                             2.467930E 02
                                                                               290
TEMP*
                                        В
                                             2.404677E 02
                                                                               291
TEMP*
                                        9
                                             2.844446E 02
                                                                               292
TEMP*
                                       10
                                             2.844446E 02
                                                                               293
                                             2.999985E 02
TEMP*
                                      100
                                                                               294
TITLE
                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
                                                                               295
                                                                               296
SUBTITLE =
                  AND TEMPERATURE CARDS PUNCHED.
                                                                               297
                                                                               298
LABEL =
                                                                               299
                                                                               300
DISPLACEMENTS
                                                                               301
REAL OUTPUT
                                                                               302
SUBCASE ID =
                                                                               303
TIME = 0.4200000E 03
                                                                               304
                                           2.838926E 02
TEMP*
                                                                               305
TEMP*
                                            2.675835E 02
                                                                               306
                                             2.451565E 02
TEMP*
                                                                               307
TEMP*
                                             2.386412E 02
                                                                               308
TEMP*
                                        5
                                             2.838926E 02
                                                                               309
TEMP*
                                             2.675835E 02
                                        6
                                                                               310
                                        7
TEMP*
                                             2.451566E 02
                                                                               311
TEMP*
                                        8
                                             2.386413E 02
                                                                               312
                                             2.838926E 02
                                                                               313
TEMP*
                                        9
                                             2.838926E 02
TEMP*
                                       10
                                                                               314
                                      100
                                             2.999985E 02
TEMP*
                                                                               315
                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
TITLE
                                                                               316
                                                                               317
D
SUBTITLE =
                  AND TEMPERATURE CARDS PUNCHED.
                                                                               318
                                                                               319
LABEL
                                                                               320
```

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321
DISPLACEMENTS
                                                                                322
                                                                                323
REAL OUTPUT
                                                                                324
SUBCASE ID =
         0.4500000E 03
                                                                                325
                                             2.833987E 02
                                                                                326
TEMP*
                                        2
                                             2.665725E 02
                                                                                327
TEMP*
                                        3
                                             2.436981E 02
                                                                                328
TEMP *
                                              2.370152E 02
                                                                                329
                                              2.833989E 02
                                                                                330
TEMP*
                                        5
                                              2.665728E 02
TEMP*
                                        6
                                                                                331
                                        7
                                              2.436982E 02
                                                                                332
TEMP*
                                              2.370153E 02
TEMP *
                                        8
                                                                                333
TEMP*
                                        9
                                              2.833989E 02
                                                                                334
TEMP*
                                       10
                                              2.833987E 02
                                                                                335
TEMP*
                                              2.999985E 02
                                      100
                                                                                336
                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
TITLE
                                                                                337
D
                                                                                338
SUBTITLE =
                  AND TEMPERATURE CARDS PUNCHED.
                                                                                339
                                                                                340
                                                                                341
LABEL
                                                                                342
DISPLACEMENTS
                                                                                343
REAL OUTPUT
                                                                                344
SUBCASE ID =
                                                                                345
TIME = 0.4800000E 03
                                                                                346
                                              2.827021E 02
                                                                                347
TEMP*
                                              2.652253E 02
TEMP*
                                                                                348
                                              2.414202E 02
TEMP*
                                                                                349
TEMP*
                                              2.345431E 02
                                                                                350
TEMP*
                                         5
                                              2.827021E 02
                                                                                351
TEMP*
                                              2.652253E 02
                                                                                352
                                         6
TEMP*
                                              2.414203E 02
                                                                                353
                                         7
TEMP*
                                         8
                                              2.345432E 02
                                                                                354
TEMP*
                                         9
                                              2.827021E 02
                                                                                355
TEMP*
                                              2.827021E 02
                                        10
                                                                                356
TEMP*
                                      100
                                              2.939985E 02
                                                                                357
TITLE
                 NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
                                                                                358
                                                                                359
D
                   AND TEMPERATURE CARDS PUNCHED.
                                                                                 360
SUBTITLE =
                                                                                 361
LABEL
                                                                                 362
                                                                                 363
DISPLACEMENTS
                                                                                364
REAL OUTPUT
                                                                                365
SUBCASE ID =
                                                                                 366
TIME = 0.5100000E 03
                                                                                 367
                                              2.818818E 02
TEMP*
                                                                                 368
                                         1
TEMP*
                                         2
                                              2.636260E 02
                                                                                369
TEMP+
                                         3
                                              2.386217E 02
                                                                                 370
TEMP*
                                         4
                                              2.314749E 02
                                                                                371
                                              2.818818E 02
                                         5
                                                                                372
TEMP*
                                              2.636262E 02
TEMP*
                                                                                 373
TEMP*
                                              2.386218E 02
                                                                                 374
TEMP*
                        1
                                         8
                                              2.314751E 02
                                                                                 375
TEMP*
                                         9
                                              2.818818E 02
                                                                                 376
                                              2.818818E 02
TEMP*
                                        10
                                                                                 377
TEMP*
                                       100
                                              2.999978E 02
                                                                                 378
TITLE
                 NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
                                                                                 379
D
                                                                                 380
SUBTITLE =
                   AND TEMPERATURE CARDS PUNCHED.
                                                                                 381
                                                                                 382
LABEL
                                                                                 383
```

```
DISPLACEMENTS
                                                                                385
REAL OUTPUT
                                                                                386
SUBCASE ID =
                                                                                387
                                                                                388
TIME = 0.5400000E 03
TEMP*
                                              2.811587E 02
                                                                                389
TEMP*
                                              2.621531E 02
                                                                                390
TEMP*
                                        3
                                              2.361725E 02
                                                                                391
TEMP*
                                              2.287193E 02
                                                                                392
TEMP*
                                         5
                                              2.811584E 02
                                                                                393
TEMP*
                                        6
                                              2.621531E 02
                                                                                394
                                        7
TEMP*
                                              2.361725E 02
                                                                                395
TEMP*
                                        8
                                              2.287193E D2
                                                                                396
TEMP*
                                              2.811584E 02
                                                                                397
TEMP*
                                        10
                                              2.811587E 02
                                                                                398
TEMP*
                                      100
                                              2,999985E 02
                                                                                399
TITLE
                NON-LINEAR TRANSIENT PROBLEM ... CYCLIJAL LOADS APPLIE
                                                                                400
                                                                                401
SUBTITLE =
                  AND TEMPERATURE CARDS PUNCHED.
                                                                                402
                                                                                403
                                                                                404
LABEL
                                                                                405
                                                                                406
DISPLACEMENTS
REAL OUTPUT
                                                                                407
SUBCASE ID =
                                                                                408
TIME = 0.5700000E 03
                                                                                409
TEMP*
                                              2.805098E 02
                                                                                410
TEMP*
                                              2.608113E 02
                                                                                411
TEMP*
                                        3
                                              2.340143E 02
                                                                                412
TEMP*
                                              2.262701E 02
                                                                                413
TEMP*
                                        5
                                              2.805098E 02
                                                                                414
TEMP*
                                        6
                                              2.608113E 02
                                                                                415
                                        7
TEMP*
                                              2.340144F 02
                                                                                416
TEMP*
                                        8
                                              2.262702E 02
                                                                                417
TEMP*
                                        9
                                              2.805098E 02
                                                                                418
TEMP*
                                              2.805098E 02
                                        10
                                                                                419
                                              2.999978E 02
TEMP*
                                      100
                                                                                420
                NON-LINEAR TRANSIENT PROBLEM ... CYCLILAL LOADS APPLIE
TITLE
                                                                                421
                                                                                422
n
                  AND TEMPERATURE CARDS PUNCHED.
                                                                                423
SUBTITLE =
                                                                                424
LABEL
                                                                                425
                                                                                426
DISPLACEMENTS
                                                                                427
REAL OUTPUT
                                                                                428
SUBCASE ID =
                                                                                429
TIME =
        0.6000000E 03
                                                                                430
                                             2.799243E 02
TEMP*
                                                                                431
TEMP*
                                        2
                                             2.595952E 02
                                                                                432
TEMP*
                                        3
                                             2.321016E 02
                                                                                433
TEMP*
                                             2.240963E 02
                                                                                434
TEMP*
                                              2.799243E 02
                                                                                435
TEMP*
                                        6
                                              2.595952E 02
                                                                                436
TEMP*
                                        7
                                              2.321016E 02
                                                                                437
TEMP*
                                        8
                                              2.240964E 02
                                                                                438
TEMP*
                                        9
                                              2.799243E 02
                                                                                439
TEMP*
                                       10
                                             2.799243E 02
                                                                                440
                                             2.999983E 02
TEMP*
                                      100
                                                                                441
                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
                                                                                442
TITLE
                                                                                443
                  AND TEMPERATURE CARDS PUNCHED.
                                                                                444
SUBTITLE =
                                                                                445
LABEL
                                                                                446
                                                                                447
```

DISPLACEMENTS

REAL OUTPUT

```
449
REAL OUTPUT
                                                                             450
SUBCASE ID =
TIME = 0.6300000E 03
                                                                             451
                                      1 2.793953E 02
                                                                             452
TEMP*
                                          2.584961E 02
                                                                             453
TEMP*
                                       2
TEMP*
                                            2.304005E 02
                                                                             454
                                            2.221654E 02
                                                                             455
TEMP*
                                                                             456
TEMP*
                                            2.793953E 02
TEMP*
                                            2.584961E 02
                                                                             457
                                            2.304006E 02
TEMP*
                                      7
                                                                             459
TEMP*
                                       8
                                            2.221655E 02
                       1
TEMP*
                                       9
                                            2.793953E 02
                                                                             460
                       1
                                            2.793953E 02
                                                                             461
TEMP*
                                      10
TEMP*
                                     100
                                            2.999980E 02
                                                                             462
                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
                                                                             463
TITLE
                                                                             464
D
                AND TEMPERATURE CARDS PUNCHED.
                                                                             465
SUBTITLE =
                                                                             466
                                                                             467
LABEL =
                                                                             468
                                                                             469
DISPLACEMENTS
REAL OUTPUT
                                                                             470
SUBCASE ID =
                                                                             471
TIME = 0.6600000E 03
                                                                             472
TEMP*
                                       1 2.789172E 02
                                                                             473
TEMP*
                                       2 2.575046E 02
                                                                             474
TEMP*
                                                                             475
                                            2.288845E 02
T: MP*
                                            2.204482E 02
                                                                             476
TEMP*
                                       5
                                            2.789172E 02
                                                                             477
                                                                             478
TEMP*
                                            2.575046E 02
                                       6
TEMP*
                                       7
                                            2.288845E 02
                                                                             479
TEMP:
                       1
                                       8
                                            2,204483E 02
                                                                             480
TEMP*
                       1
                                       9
                                            2.789172E 02
                                                                             481
TEMP*
                                      10
                                            2.789172E 02
                                                                             482
TEMP*
                                     100
                                            2.999980E 02
                                                                             483
                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
                                                                             484
TITLE
                                                                             485
                AND TEMPERATURE CARDS PUNCHED.
                                                                             486
SUBTITLE =
                                                                             487
LABEL =
                                                                             488
                                                                             489
                                                                             490
DISPLACEMENTS
REAL OUTPUT
                                                                             491
SUBCASE ID =
                                                                             492
TIME = 0.6900000E 03
                                                                             493
TEMP*
                                          2.784856E 02
                                                                             494
TEMP*
                                           2.566111E 02
TEMP*
                                            2.275311E 02
TEMP*
                                            2.189187E 02
TEMP*
                                       5
                                            2.784856E 02
                                                                             498
TEMP*
                                       6
                                            2.566111E 02
                                                                             499
TEMP*
                                       7
                                            2.275313E 02
                                                                             500
                                            2.189188E 02
                                                                             501
TEMP*
TEMP*
                                       9
                                            2.784856E 02
                                                                             502
TEMP*
                                      10
                                            2.784856E 02
                                                                             503
TEMP*
                                     100
                                            2.999980E 02
                                                                              504
TITLE
                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
                                                                              505
                                                                              506
SUBTITLE =
                 AND TEMPERATURE CARDS PUNCHED.
                                                                              507
                                                                              508
LABEL =
                                                                              509
                                                                              510
DISPLACEMENTS
                                                                              511
```

```
SUBCASE ID =
                                                                                513
TIME =
        0.7200000E 03
                                                                                514
TEMP*
                                             2.780964E 02
                                                                               515
TEMP*
                                        2
                                             2.558067E 02
                                                                               516
TEMP*
                                        3
                                             2 263217F 02
                                                                               517
TEMP*
                                             2.175545E 02
                                                                               518
TEMP*
                                             2.780964E 02
                                                                               519
TEMP*
                                             2 558067F 02
                                                                               520
TEMP*
                                             2.263218E 02
                                                                               521
TEMP*
                                        8
                                             2.175546E 02
                                                                               522
TEMP*
                                             2.780964E 02
                                        q
                                                                               523
TEMP*
                                       10
                                             2.780964E 02
                                                                               524
TEMP*
                                      100
                                             2.999980E 02
                                                                               525
TITLE
                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
                                                                               526
n
                                                                               527
SUBTITLE =
                  AND TEMPERATURE CARDS PUNCHED.
                                                                               528
                                                                               529
LARFI
                                                                               530
                                                                               531
DISPLACEMENTS
                                                                               532
REAL OUTPUT
                                                                               533
SUBCASE ID =
                                                                               534
TIME =
         0.7500000E 03
                                                                               535
TEMP*
                                             2.777458E 02
                                                                               536
TEMP*
                                             2.550829E 02
                                                                               537
TEMP*
                                        3
                                             2.252398E 02
                                                                               538
TEMP*
                                             2.163365E 02
                                                                               539
TEMP*
                                        5
                                             2.777458E 02
                                                                               540
TEMP*
                                        6
                                             2.550830E 02
                                                                               541
TEMP*
                                        7
                                             2.252399E 02
                                                                               542
TEMP*
                                        8
                                             2.163364E 02
                                                                               543
TEMP*
                                        9
                                             2.777458E 02
                                                                               544
TEMP*
                                       10
                                             2.777458E 02
                                                                                545
TEMP*
                                             2.999980E 02
                                      100
                                                                               546
TITLE
                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
                                                                               547
                                                                               548
SUBTITLE =
                  AND TEMPERATURE CARDS PUNCHED.
                                                                               549
                                                                               550
LABEL =
                                                                               551
                                                                               552
DISPLACEMENTS
                                                                               553
REAL OUTPUT
                                                                               554
SUBCASE ID =
                                                                               555
TIME =
         0.7800000E 03
                                                                               556
TEMP*
                                             2.774302E 02
                                                                               557
TEMP*
                                             2.544321E 02
                                                                               558
TEMP*
                                             2.242713E 02
                                                                               559
TEMP*
                                             2.152476E 02
                                                                               560
TEMP*
                                        5
                                             2.774302E 02
                                                                               561
TEMP*
                                             2.544321E 02
                                                                               562
TEMP*
                                             2.242713E 02
                                                                               563
TEMP*
                                             2.152476E 02
                                                                               564
TEMP*
                                        9
                                             2.774302E 02
                                                                               565
TEMP*
                                       10
                                             2.774302E 02
                                                                               566
                                             2.999980E 02
TEMP*
                                      100
                                                                               567
TITLE
                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
                                                                               568
D
                                                                               569
                  AND TEMPERATURE CARDS PUNCHED.
SUBTITLE =
                                                                               570
                                                                               571
LABEL
                                                                               572
                                                                               573
DISPLACEMENTS
                                                                               574
REAL OUTPUT
                                                                               575
```

SUBCASE ID =

```
C.8100000E 03
                                                                                 577
TIME =
TEMP*
                                              2.771460E 02
                                                                                 578
                                              2,538469E 02
                                                                                  579
TEMP*
                                              2.234037E 02
                                                                                  580
TEMP*
TEMP*
                                              2.142735E 02
                                                                                 581
                                         5
                                              2.771460E 02
                                                                                 582
TEMP*
                                         6
                                              2,538469E 02
                                                                                  583
TEMP*
                                         7
                                              2.234039E 02
TEMP*
                                                                                  584
                                         8
                                              2.142735E 02
                                                                                  585
TEMP*
TEMP*
                                         9
                                              2.771460E 02
                                                                                  586
TEMP*
                                        10
                                              2.771460E 02
                                                                                  587
TEMP+
                                       100
                                              2.999980E 02
                                                                                  588
                 NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
                                                                                  589
TITLE
                                                                                  590
SUBTITLE =
                   AND TEMPERATURE CARDS PUNCHED.
                                                                                  591
                                                                                  592
                                                                                  593
LABEL
                                                                                  594
DISPLACEMENTS
                                                                                  595
REAL OUTPUT
                                                                                  596
SUBCASE ID =
                                                                                  597
TIME =
         0.8400000E 03
                                                                                  598
TEMP*
                                               2,768904E 02
                                                                                  599
TEMP*
                                               2.533208E 02
                                                                                  600
TEMP*
                                               2.226263E 02
                                                                                  601
                                               2.134011E 02
TEMP+
                                                                                  602
TEMP*
                                         5
                                               2.768906E 02
                                                                                  603
TEMP+
                                         6
                                               2.533209F 02
                                                                                  604
                                         7
                                                                                  605
TEMP *
                                               2.226263E 02
TEMP *
                                               2.134012E 02
                                                                                  606
TEMP*
                                               2.768906E 02
                                                                                  607
TEMP*
                                               2.768904E 02
                                        10
                                                                                  608
TEMP*
                                       100
                                              2.999980E 02
                                                                                  609
TITLE
                 NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE .
                                                                                  610
                                                                                  611
                   AND TEMPERATURE CARDS PUNCHED.
SUBTITLE =
                                                                                  612
                                                                                  613
LABEL
                                                                                  614
                                                                                  615
DISPLACEMENTS
                                                                                  616
REAL OUTPUT
                                                                                  617
SUBCASE ID =
                                                                                  618
TIME =
         0.8700000E 03
                                                                                  619
TEMP*
                                               2.766606E 02
                                                                                  620
TEMP*
                                               2.528482E 02
                                                                                  621
TEMP*
                                               2.219292E 02
                                                                                  622
TEMP*
                                               2.126197E 02
                                                                                  623
TEMP*
                                         5
                                               2.766606E 02
                                                                                  624
TEMP -
                                               2,528482E 02
                                         6
                                                                                  625
TEMP*
                                         7
                                               2,219293E 02
                                                                                  626
TEMP*
                                               2.126198E 02
                                                                                  627
TEMP*
                                               2.766606E 02
                                                                                  628
TEMP*
                                         10
                                               2.766606E 02
                                                                                  629
TEMP*
                                               2.999980E 02
                                       100
                                                                                  630
                 NON-LINEAR TRANSIENT PROBLEM ... CYCLIJAL LOADS APPLIE
TITLE
                                                                                  631
                                                                                  632
SUBTITLE =
                   AND TEMPERATURE CARDS PUNCHED.
                                                                                  633
                                                                                  634
LABEL
                                                                                  635
                                                                                  636
DISPLACEMENTS
                                                                                  637
REAL OUTPUT
                                                                                  638
SUBCASE ID =
                                                                                  639
```

TIME = 0.900000E 03

```
TEMP*
                                             2.767090E 02
                                                                                641
TEMP*
                                             2.528671E 02
                                                                                642
                                                                                643
TEMP*
                                             2,222810E 02
TEMP*
                                             2.129424E 02
                                                                                644
TEMP*
                                        5
                                             2.767090E 02
                                                                                645
TEMP*
                                             2.528671E 02
                                        6
                                                                                646
TEMP*
                                        7
                                             2.222812E 02
                                                                                647
                                             2.129426E 02
TEMP*
                                        8
                                                                                648
                                             2.767090E 02
TEMP*
                                        9
                                                                                649
TEMP*
                                             2.767090E 02
                                       10
                                                                                650
TEMP*
                                      100
                                             2.999980E 02
                                                                                651
                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
TITLE
                                                                                652
                                                                                653
SUBTITLE =
                  AND TEMPERATURE CARDS PUNCHED.
                                                                                654
                                                                                655
LABEL
                                                                                656
                                                                                657
DISPLACEMENTS
                                                                                658
REAL OUTPUT
                                                                                659
SUBCASE ID =
                                                                                660
TIME =
         0.9300000E 03
                                                                                661
TEMP*
                                             2.769492E 02
                                                                                662
TEMP*
                                             2.532791E 02
                                                                                663
TEMP*
                                             2.233669E 02
                                        3
                                                                                664
TEMP*
                                             2.141017E 02
                                                                                665
TEMP*
                                             2.769492E 02
                                        5
                                                                                666
TEMP*
                                             2.532792E 02
                                                                                667
TEMP*
                                             2.233670E 02
                                                                                668
TEMP*
                                        8
                                             2,141018E 02
                                                                                669
TEMP*
                                        9
                                             2.769492E 02
                                                                                670
                                             2.769492E 02
                                                                                671
TEMP*
                                       10
TEMP*
                                      100
                                             2.999980E 02
                                                                                672
                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
TITLE
                                                                                673
D
                                                                                674
SUBTITLE =
                  AND TEMPERATURE CARDS PUNCHED.
                                                                                675
                                                                                676
                                                                                677
LABEL
                                                                                678
DISPLACEMENTS
                                                                                679
REAL OUTPUT
                                                                                680
SUBCASE ID =
                                                                                681
                        1
POINT ID =
                                                                                682
                                             3.000000E 02
                                                                                683
TEMP*
TEMP*
                               1109262336
                                             2.987498E 02
                                                                                684
                               1111228416
                                             2.966760E 02
TEMP*
                                                                                685
                                             2.948879E 02
TEMP*
                               1113194496
                                                                                686
                               1115160576
                                             2.932939E 02
TEMP*
                                                                                687
TEMP*
                                             2.918564E 02
                               1117126656
                                                                                688
                                             2,905571E 02
                                                                                689
TEMP*
                               1119092736
TEMP*
                               1121058816
                                             2.873835E 02
                                                                                690
                                             2.883252E 02
TEMP*
                               1123024896
                                                                                691
                               1125179392
                                             2.873728E 02
TEMP*
                                                                                692
TEMP*
                               1125302272
                                             2.865171E 02
                                                                                693
TEMP*
                               1125425152
                                             2.857493E 02
                                                                                694
TEMP*
                               1125548032
                                             2.850610E 02
                                                                                695
                               1125670912
                                             2.844446E 02
                                                                                696
TEMP*
TEMP*
                               1125793792
                                             2.838926E 02
                                                                                697
                                             2.833987E 02
TEMP*
                               1125916672
                                                                                698
                               1126039552
                                             2.827021E 02
TEMP*
                                                                                699
                                             2.818818E 02
TEMP*
                               1126162432
                                                                                700
                               1126285312
                                             2.811587E 02
                                                                                701
TEMP*
TEMP*
                                             2.805098E 02
                                                                                702
                               1126408192
                                             2.799243E 02
                                                                                703
TEMP*
                               1126531072
                                             2.793953E 02
                                                                                704
TEMP*
                               1126653952
```

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TEMP*
                               1126776832
                                              2.789172E 02
                                                                                 705
TEMP
                               1126899712
                                              2.784856E 02
                                                                                 706
                               1127022592
                                              2.780964E 02
                                                                                 707
TEMP*
                                              2.777458E 02
                                                                                 708
TEMP*
                               1127145472
                                              2.774302E 02
TFMP*
                               1127268352
                                                                                 709
TEMP*
                               1127391232
                                              2.771460E 02
                                                                                 710
                                              2.768904E 02
                                                                                 711
TEMP*
                               1127514112
                                              2.766606E 02
                               1127636992
                                                                                 712
TEMP*
                                              2.767090F 02
                                                                                 713
TEMP*
                               1127759872
TEMP*
                               1127882752
                                              2.769492E 02
                                                                                 714
                NON-LINEAR TRANSIENT PROBLEM ... CYCLIJAL LOADS APPLIE
                                                                                 715
TITLE
                                                                                 716
                   AND TEMPERATURE CARDS PUNCHED.
                                                                                 717
SUBTITLE =
                                                                                 71 B
                                                                                 719
LABEL
                                                                                 720
                                                                                 721
DISPLACEMENTS
                                                                                 722
REAL OUTPUT
                                                                                 723
SUBCASE ID =
                                                                                 724
POINT ID =
                                                                                 725
TEMP*
                                              3.000000E 02
TEMP*
                               1109262336
                                              2.978250E 02
                                                                                 726
TEMP*
                                1111228416
                                              2.939788E 02
                                                                                 727
                                1113194496
                                              2.903755E 02
                                                                                 728
TEMP*
                                              2.870679E 02
                                                                                 729
TEMP*
                                1115160576
TEMP*
                                1117126656
                                              2.840625E 02
                                                                                 730
                                1119092736
                                              2.813474E 02
                                                                                 731
TEMP*
                                1121058816
                                              2.789028E 02
                                                                                 732
TFMP*
                                              2.767068E 02
                                                                                 733
TEMP*
                                1123024896
TEMP*
                                1125179392
                                              2.747371E 02
                                                                                 734
                                1125302272
                                              2.729722E 02
                                                                                 735
TEMP*
                                              2.713923E 02
TEMP*
                                1125425152
                                                                                 736
TEMP*
                                1125548032
                                              2.609785E 02
                                                                                 737
TEMP*
                                1125670912
                                              2.687141E 02
                                                                                 738
                                1125793792
                                               2.675835E 02
                                                                                 739
TEMP*
                                               2.665725E 02
                                                                                 740
TEMP*
                                1125916672
                                1126039552
                                               2.652253E 02
                                                                                 741
TEMP*
                                               2.636260E 02
                                                                                  742
TEMP*
                                1126162432
TEMP*
                                1126285312
                                               2.621531E 02
                                                                                  743
                                               2.608113E 02
                                                                                  744
TEMP*
                                1126408192
                                                                                  745
                                1126531072
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TEMP*
                                               2.584961E 02
                                                                                  746
TEMP*
                                1126653952
TEMP*
                                1126776832
                                               2.575046E 02
                                                                                  747
                                1126899712
                                               2.566111E 02
                                                                                  748
TEMP*
                                               2.558067E 02
                                                                                  749
                                1127022592
TEMP*
                                                                                  750
                                1127145472
                                               2.550829E 02
TEMP*
                                               2.544321E 02
                                                                                  751
TEMP*
                                1127268352
TEMP*
                                1127391232
                                               2.538469E 02
                                                                                  752
                                               2.533208E 02
                                1127514112
                                                                                  753
TEMP*
                                               2.528482E 02
                                                                                  754
                                1127636992
TEMP*
                                               2.528671E 02
                                                                                  755
TEMP*
                                1127759872
                                               2.532791E 02
TEMP*
                                1127882752
                                                                                  756
TITLE
                 NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
                                                                                  757
                                                                                  758
                   AND TEMPERATURE CARDS PUNCHED.
                                                                                  759
SUBTITLE =
                                                                                  760
                                                                                  761
LABEL
                                                                                  762
                                                                                  763
DISPLACEMENTS
                                                                                  764
REAL OUTPUT
                                                                                  765
SUBCASE ID =
                       3
                                                                                  766
 POINT ID =
                                               3.000000E 02
                                                                                  767
 TEMP*
                                          0
                                1109262336
                                               2,9521005 02
                                                                                  768
TEMP*
```

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TEMP*
                                1111228416
                                                2.873252E 02
                                                                                   769
TEMP*
                                1113194496
                                                2.806938E 02
                                                                                   770
TEMP*
                                1115160576
                                                2.750024E 02
                                                                                   771
TEMP*
                                1117126656
                                               2.700610E 02
                                                                                   772
                                               2.657405E 02
TEMP*
                                1119092736
                                                                                   773
TEMP*
                                1121058816
                                               2.619446E 02
                                                                                   774
                                1123024896
                                               2.585981E 02
TEMP*
                                                                                   775
                                                                                   776
TEMP*
                                1125179392
                                                2.556405E 02
TEMP*
                                1125302272
                                                2.530206E 02
                                                                                   777
TEMP*
                                1125425152
                                                2.506960E 02
                                                                                   778
                                                                                   779
TEMP*
                                1125548032
                                                2,486305E 02
TEMP*
                                1125670912
                                                2.467929E 02
                                                                                   780
TEMP*
                                1125793792
                                                2.451565E 02
                                                                                   781
TEMP*
                                1125916672
                                               2.436981E 02
                                                                                   782
TEMP*
                                1126039552
                                               2.414202E 02
                                                                                   783
                                               2.386217E 02
TEMP*
                                1126162432
                                                                                   784
TEMP*
                                1126285312
                                                2.361725E 02
                                                                                   785
TEMP*
                                1126408192
                                                2.340143E 02
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TEMP*
                                1126531072
                                               2.321016E 02
                                                                                   787
                                               2.304005E 02
TEMP*
                                1126653952
                                                                                   788
                                               2.288845E 02
TEMP*
                                1126776832
                                                                                   789
TEMP*
                                1126899712
                                               2.275311E 02
                                                                                   790
TEMP*
                                1127022592
                                               2.263217E 02
                                                                                   791
TEMP*
                                1127145472
                                               2.252398E 02
                                                                                   792
TEMP+
                                1127268352
                                                2.242713E 02
                                                                                   793
TEMP*
                                1127391232
                                               2.234037E 02
                                                                                   794
                                                                                   795
TEMP*
                                1127514112
                                               2.226263E 02
TEMP*
                                1127636992
                                               2.219292E 02
                                                                                   796
TEMP*
                                1127759872
                                               2.222810E 02
                                                                                   797
TEMP*
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TITLE
                 NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
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SUBTITLE =
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                                                                                   801
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LABEL
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DISPLACEMENTS
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REAL OUTPUT
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POINT ID =
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                                1113194496
TEMP*
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                                                                                   812
                                               2.724622E 02
TEMP*
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                                                                                   813
TEMP*
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TEMP*
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TEMP*
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TEMP*

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TEMP*
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TITLE
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                                                                               841
                                                                               842
D
SUBTITLE =
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                                                                               843
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LABEL
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DISPLACEMENTS
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REAL OUTPUT
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D
                   AND TEMPERATURE CARDS PUNCHED.
SUBTITLE =
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LABEL
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DISPLACEMENTS
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REAL OUTPUT
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SUBCASE ID =
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1113194496

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TEMP*
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TEMP*
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                NON-LINEAR TRANSIENT PROBLEM ... CYCLIJAL LOADS APPLIE
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TITLE
                                                                                926
                  AND TEMPERATURE CARDS PUNCHED.
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SUBTITLE =
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LABEL
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DISPLACEMENTS
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REAL OUTPUT
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POINT ID =
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TEMP*
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TEMP*
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TEMP*
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TEMP*
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TEMP*
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TEMP*
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TEMP*
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TEMP*
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                NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
TITLE
D
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SUBTITLE =
                  AND TEMPERATURE CARDS PUNCHED.
                                                                                969
                                                                                970
                                                                                971
LABEL
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DISPLACEMENTS
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REAL OUTPUT
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SUBCASE ID =
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POINT ID =
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TEMP*
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                        1
TEMP*
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                        1
                               1117126656
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TEMP*
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                               1126899712
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TEMP*
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TEMP*
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TEMP*
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                                              2.141018E 02
TEMP*
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TITLE
                 NON-LINEAR TRANSIENT PROBLEM . . . CYCLICAL LOADS APPLIE
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SUBTITLE =
                   AND TEMPERATURE CARDS PUNCHED.
                                                                               1011
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LABEL
                                                                               1013
                                                                               1014
 DISPLACEMENTS
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 REAL OUTPUT
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SUBCASE ID =
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 POINT ID =
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1117123656

2.918564E 02

1024

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TEMP*
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TEMP*
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TEMP*
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                                               2.766606E 02
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TITLE
                 NON-LINEAR TRANSIENT PROBLEM ... CYCLI_AL LOADS APPLIE
                                                                                  1051
                                                                                  1052
D
SUBTITLE =
                   AND TEMPERATURE CARDS PUNCHED.
                                                                                  1053
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LABEL
                                                                                  1055
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DISPLACEMENTS
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REAL OUTPUT
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TEMP*
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TEMP*
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                                                                                1091
TEMP*
                                              2.769492E 02
                               1127882752
                                                                                1092
TITLE
                 NON-LINEAR TRANSIENT PROBLEM ... CYCLICAL LOADS APPLIE
                                                                                1093
                                                                                1094
SUBTITLE =
                   AND TEMPERATURE CARDS PUNCHED.
                                                                                1095
                                                                                1096
LABEL
                                                                                1097
                                                                                1098
DISPLACEMENTS
                                                                                1099
REAL OUTPUT
                                                                                1100
SUBCASE ID =
                                                                                1101
POINT ID =
                    100
                                                                                1102
TEMP*
                                              3.000000E 02
                                                                                1103
                                              2.999988E 02
TEMP*
                               1109262336
                                                                                1104
TEMP*
                                1111228416
                                              2.99998E 02
                                                                                1105
TEMP*
                               1113194496
                                              2.909988E 02
                                                                                1106
TEMP*
                               1115160576
                                              2.999995E 02
                                                                                1107
TEMP*
                                              2.999983E 02
                               1117126656
                                                                                1108
TEMP*
                               1119092736
                                              2.999993E 02
                                                                                1109
                                              2.909983E 02
TEMP*
                                1121058816
                                                                                1110
TEMP*
                               1123024896
                                              2.909990E 02
                                                                                1111
TEMP*
                                1125179392
                                              2.919983E 02
                                                                                1112
TEMP*
                               1125302272
                                              2.979990E 02
                                                                                1113
TEMP*
                                1125425152
                                              2.9 9983E 02
                                                                                1114
TEMP*
                                1125548032
                                              2.99998E 02
                                                                                1115
TEMP*
                                1125670912
                                              2.949985E 02
                                                                                1116
TEMP*
                                1125793792
                                              2.909985E 02
                                                                                1117
TEMP*
                                1125916672
                                              2.979985E 02
                                                                                1118
TEMP*
                                1126039552
                                              2.999985E 02
                                                                                1119
TEMP*
                                1126162432
                                              2,9'9978E 02
                                                                                1120
TEMP*
                                1126285312
                                              2.919985E 02
                                                                                1121
TEMP*
                                              2.999978E 02
                                1126408192
                                                                                1122
TEMP*
                                1126531072
                                              2,999983E 02
                                                                                1123
                                              2.979980E 02
TEMP*
                                1126653952
                                                                                1124
TEMP*
                               1126776832
                                              2.999980E 02
                                                                                1125
TEMP*
                                              2,999980E 02
                               .1126899712
                                                                                1126
TEMP*
                               1127022592
                                              2,959980E 02
                                                                                1127
TEMP*
                                1127145472
                                              2.999980E 02
                                                                                1128
                                              2.999980E 02
TEMP*
                                1127268352
                                                                                1129
TEMP*
                                1127391232
                                              2.999980E 02
                                                                                1130
                                              2.999980E G2
TEMP*
                                1127514112
                                                                                1131
TEMP*
                                1127636992
                                              2.999980E 02
                                                                                1132
TEMP*
                                              2.999980E 02
                                1127759872
                                                                                1133
TEMP*
                                1127882752
                                              2.9999BOE 02
                                                                                1134
```

NAS	TRAN LOADED	AT LO	CATION 10FA38					
*	O CPU-SEC		O E-SEC	0	IG-CNT	SEM1	BEGN	
*	O CPU-SEC		O E-SEC	0	IO-CN7	SEMT		
*	1 CPU-SEC		3 E-SEC	0	IO-CNT	NAST		
*	1 CPU-SEC		3 E-SEC	0	IO-CNT	GNFI		
*	1 CPU-SEC		4 E-SEC	0	IO-CNT	XCSA		
*	1 CPU-SEC		6 E-SEC	0	IO-CNT	IFP1		
*	1 CPU-SEC	1	O E-SEC	0	IO-CNT	XSOR		
*	2 CPU-SEC	1	5 E-SEC	0	IO-CNT	DO	IFP	
*	2 CPU-SEC	3		0	IO-CNT	END	IFP	
*	2 CPU-SEC	3		0	IO-CNT	XGPI		
•	4 CPU-SEC		9 E-SEC	0	IO-CNT	SEM1	END	
*	5 CPU-SEC	4	O E-SEC	0	IO-CNT	CORE	LEFT	48432
٠	5 CPU-SEC		O E-SEC	0	IO-CNT	LINK	BEGN	NS02
*	5 CPU-SEC			0	IO-CNT	-	LINK EN	D
*	5 CPU-SEC		2 E-SEC	0	IO-CNT	XSFA		
*	5 CPU-SEC		3 E-SEC	0	IO-CNT	XSFA		
*	5 CPU-SEC		3 E-SEC	0	IO-CNT	4	GP1	BEGN
*	5 CPU-SEC		O E-SEC	0	IO-CNT	4	GP1	END
*	5 CPU-SEC	_	O E-SEC	0	IO-CNT	7	GP2	BEGN
*	5 CPU-SEC	_	1 E-SEC	0	IO-CNT	7	GP2	END
*	5 CPU-SEC		2 E-SEC	0	IO-CNT	9	PLTHBDY	
*	5 CPU-SEC		6 E-SEC	0	IO-CNT	9	PLTHBDY	
*	5 CPU-SEC		7 E-SEC	0	IO-CNT	9	PLTSET	BEGN
*	5 CPU-SEC		2 E-SEC	0	IO-CNT	9	PLTSET	END
*	5 CPU-SEC	_	3 E-SEC	0	IO-CNT	11	PRTMSG	BEGN
*	5 CPU-SEC		3 E-SEC	0	IO-CNT	11	PRTMSG	END
*	5 CPU-SEC			0	IO-CNT	12	SETVAL	BEGN
*	5 CPU-SEC	_	3 E-SEC	0	IO-CNT	12	SETVAL	END
*	5 CPU-SEC	-	4 E-SEC	0	IO-CNT	15	PLOT	BEGN
*	6 CPU-SEC		1 E-SEC	0	IO-CNT	15	PLOT	END
*	6 CPU-SEC		1 E-SEC	0	IO-CNT	17	PRTMSG	BEGN
*	6 CPU-SEC		2 E-SEC	0	IO-CNT	17	PRTMSG	END
*	6 CPU-SEC	7	2 E-SEC	0	IO-CNT	17	EXIT	BEGN

THE



PROGRAM

ED PUCCINELLI REG MITCHELL CLIFF JACKSON

VERSION TWO----AUGUST 22, 1974

* CASE 1 *

PROBLEM TITLE GENERATE RADMIX AND RADLST CARDS ... PROBLEM TWELVE

.......

COLUMNS	VARIABLE	VALUE	DESCRIPTION
9-16	I ENDTM	1	ENTER CPU TIME USED ON JOB CARD (IN MINUTESUSE H FOR ONE-HALF MINUTE) DEFAULT IENDTM=100000 (SEE DOCUMENTATION).
17-24	NT	0	LE O -DO NOT COPY INPUT DATA ONTO TAPE (UNIT 2) FOR RESTART USE GT O -COPY INPUT DATA ONTO TAPE (UNIT 2) FOR RESTART USE
25-32	NVFCAL	0	3T O -VF CALCULATED USING FINITE DIFFERENCE METHOD LT O -VF CALCULATED USING CONTOUR INTEGRATION METHOD EQ O -PROGRAM SELECTS METHOD TO BE USED (SEE DOCUMENTATION)
33-40	NFE	0	LE O -MESH SIZE FOR EACH ELEMENT SPECIFIED ON INPUT DATA GT O -MESH SIZE SET TO 1 BY 1 FOR EACH ELEMENT. (OVERRIDES INPUT DATA)
41-48	NFS	0	GE O -SHADING CONSIDERED USING DATA FROM INPUT LT O -NEGLECT ALL SHADING
49-56	RMAX	0.0	MAXIMUM AREA/DISTANCE RATIO. DEFAULT RMAX = 0.1 (SEE DOCUMENTATION).

NASTRAN FORMATTED INPUT

SEMI-SORTED BULK DATA ECHO

) . * * * * * * *	2 ******	3 ********	4	5	6 *****	7 *******	8 ******	9 ******	10
CHBDY CHBDY CHBDY CHBDY CHBDY	200 300 400 500 600 700	2000 2000 2000 2000 2000 2000	AREA4 AREA4 AREA4 AREA4 AREA4	1 2 3 5 6 7	2 3 4 6 7 8	6 7 8 2 3 4	5 6 7 1 2 3	10 10 10 10 10	
GRID GRID GRID GRID GRID GRID GRID GRID	1 2 3 4 5 6 7 8 9 10		01 .2 .3 01 .2 .3 01 .2 .3 05 0. 005	0. 0. 0. 0. .1 .1 .1 .2 .1	0. 0. 0. 0. 0. 0. 0. 0.				
РНВDҮ ҮСБНЧ	300 2000	3000	.314	· . '90' · ·					
SVIEW	10	0	0	3	3				

INPUT SUMMARY

NUMBERS OF COMPLETE LOGICAL CARD TYPES DETECTED

CHBDY = 6 CORD1 = 0 CORD2 = 0 GRDSET = C GRID = 11 PHBDY = 2. VIEW = 1

WARNING 33 103 LOGICAL CARD(S) DETECTED OF TYPE(S) NOT RECOGNIZED BY VIEW

VIEW FACTORS

ELEMENT	AREA	ELEM TO ELEM = VIEW FACTOR	ELEM TO ELEM = VIEW FACTOR	VF SUM FROM ELEMENT
			• • • • • • • • • • • • • • • • • • • •	• • • • • • • • • • • • • • • • • • • •
200	0.10C00E-01	***********	****************	************* 0.0
300	0.10C00E-01	**************	***************	······································
400	0.10000E-01	******************************	***********	************ 0.0
500	0.1000E-01	<i>~************************************</i>	************	**************************************
600	0.10000E-01	**************	*************	**************************************
700	0.10000E-01	<i> ************************************</i>	<i>~~</i> * * * * * * * * * * * * * * * * * *	**********

PROGRAM SUMMARY FOR CASE 1

PROGRAM TERMINATED NORMALLY

CPU TIME(SECONDS)

11

PROCESSING OF INPUT DATA= (
VIEW FACTOR COMPUTATIONS=

NUMBER OF VIEW FACTOR COMPUTATIONS

FINITE DIFFERENCE = O
CONTOUR INTEGRAL = O

REQUESTED CORE SPACE ALLOWS THE INPUT DATA GENERATED

272 ELEMENTS 6 ELEMENTS 599 SUB-ELEMENTS 54 SUB-ELEMENTS 1232 SUB-ELEMENTS

AFTER COMPRESSION
816 GRID POINTS 11 GRID POINTS

53K BYTES OF CORE WERE NOT USED IN THIS CASE.

(55K ON ELEMENTS. 53K ON SUB-ELEMENTS AND 56K ON GRID POINTS.)

* END CASE 1 * .

**** RUN COMPLETED ****

RADMTX	1.0	٥.	.0	٠.	О,	.0
RADMIX	2.0	. 0	. 0	.0	.0	
RADMIX	3.0	.0	. 0	.0		
RADMTX	4.0	. 0	. 0			
RADMTX	5.0	.0				
RADMTX	6.0					
RADIST	200	300	400	500	600	700

```
$
$
ID CLASS PROBLEM THIRTEEN, C.E. JACKSON
$ MAXIMUM CPU TIME ALLOWED FOR THE JOB
$
TIME 10
$
S THE THERMAL ANALYZER PORTION OF NASTRAN IS TO BE USED
APP HEAT
$ THE LINEAR STEADY-STATE SOLUTION ALGORITHM IS TO BE USED
¢.
SOL 1
$ REQUEST FOR DIAGNOSTIC WHICH PRINTS OUT CONVERGENCE CRITERIA
$ PRODUCES OUTPUT ONLY FOR SOL 3
DIAG 18
$ THE FOLLOWING ALTER IS REQUIRED TO GENERATE PLOTS USING A SPECIAL
$ VERSION OF NASTRAN WHICH IS REQUESTED BY THE JOB CONTROL STATEMENTS.
$-- VARIANCE ANALYSIS AND PLOT OF HBDY ELEMENTS --- 1 ------ 11/21/73 -00000010
$
      APPROACH HEAT
                         SOL 1
                                                                       00000020
$
      MODULES
                                                                       00000030
$
         PLITHBDY MAKES HEDY ELEMENTS PLOTTABLE. CAN PRINT MESH DATA
                                                                       00000040
$
         VARIAN
                  COMPUTES DERIVATIVES EVERY LOOP, VARIANCES LAST LOOP 00000050
      DATA CARDS
$
                                                                       00000060
         1PARM
                  SELECT SIZE OF PARAMETER VARIATION (DEFAULT = 1 0)
                                                                       00000070
$
                  SPECIFY FUNCTIONAL DEPENDENCE OF INPUT UPON PARAMETERS00000080
S
         1 V A R Y
                  SPECIFY DEVIATION OF PARAMETERS
$
         VARIAN
                                                                       00000090
         PARAM DELTA DENOMINATOR FOR DERIVATIVE (DEFAULT = 1.0)
                                                                       00000100
         PARAM MESH
                      PRINT MESH DATA IF EQUAL YES (DEFAULT = NO)
                                                                       00000110
      SYSTEM(62)
                       JRUN. MUST BE SET FOR MANUAL MODE
                                                                       00000120
      DIAG 40 WILL PRINT MESSAGES ABOUT VARIED DATA CARDS
                                                                       00000130
$ THE FIRST PUN (URUN.EO.O) MUST WRITE NPTP AND INPT TAPES
                                                                       00000140
$ ADDITIONAL RUNS ( RUN, CE. 1) MUST READ OPTP AND READ/WRITE INPT TAPES
                                                                       00000150
ALTER 9.9
                                                                       00000160
PLTHBDY GEOM2, ECT. EPT. SIL. EQEXIN, BGPDT/PECT. PSIL, PEQIN, PBGPDT/V.N.
                                                                       00000170
         NHBDY/V, Y. NESH=NO $
                                                                       00000180
SAVE
         NH3CY $
                                                                       00000190
EQUIV
         ECT. PECT/NHBDY/SIL, PSIL/NHBDY/EQEXIN, PEQIN/NHBDY/
                                                                       00000200
         BGPDT.PBGPDT/NHBDY $
                                                                       00000210
         PCDB. PEQIN. PECT/PLTSETX. PLTPAR, GPSETS, ELSETS/V.N. NSIL/V.N.
PLTSET
                                                                       00000220
```

JANUARY 13, 1976 NASTRAN 12/12/73 PAGE

NASTRAN EXECUTIVE CONTROL DECK ECHO

JUMPPLOT \$

ALTER 15.15
PLOT PLTPAR, GPSETS, ELSETS, CASECC, PBGPDT, PEQIN, PSIL..., PLOTX1/ V.N.
NSIL/V, N, LUSET/V, N, JUMPPLOT/V, N, PLTFLG/V, N, PFILE \$

ENDALTER 17
EXIT \$
ENDALTER \$
CEND

PAGE

CASE CONTROL DECK ECHO

```
CARD
COUNT
1
2
       $ END OF EXECUTIVE CONTROL --- START CASE CONTROL *****************************
3
 ă
 5
                      LINEAR STEADY-STATE PROBLEM ... PLOT CHBDY CARDS
 6
       TITLE=
       $ SPECIFY 51 LINES OF DATA PER PAGE (DOES NOT .NCLUDE HEADINGS AT TOP OF PAGE)
8
9
10
       1 INF=51
11
       $ REQUEST SORTED AND UNSORTED OUTPUT
12
       $ IF THIS CARD IS OMITTED, ONLY THE SORTED BULK DATA WILL APPEAR
13
14
15
       ECHO=BOTH
16
       $ SELECT THE SPC. MPC. AND LOAD SETS TO BE USED IN THIS SOLUTION
17
18
19
       SPC=100
       MPC=200
20
21
       LOAD=300
22
23
       $ SELECT THE TEMPERATURE SET WHICH IS AN ESTIMATE OF THE FINAL SOLUTION VECTOR
24
25
       TEMP(MATERIAL)=400
26
       $ SELECT THE OUTPUT DESIRED (TEMPERATURES, LOADS, AND CONSTRAINT POWERS)
27
28
29
       OUTPUT
30
       THERMAL=ALL
31
       OLOAD=ALL
32
       SPCF=ALL
33
       $ THE FOLLOWING CARDS REQUEST THE CHBDY PLOT
34
35
36
       OUTPUT(PLOT)
37
       SET 1 INCLUDE HBDY
38
       FIND SET 1 ORIGIN 1 SCALE
       PLOT SET 1 ORIGIN 1 LABEL GRID POINTS
39
40
       PLOT SET 1 ORIGIN 1 LABEL ELEMENTS
41
42
43
       44
45
46
       BEGIN BULK
```

\$ MPC

MPC

\$

SLOAD

200

200

300

S DEFINE APPLIED LOADS

9

10

4.

1.

1.

2

8.

PAGE

```
INPUT BULK DATA DECK ECHO
    1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 .
$ UNITS MUST BE CONSISTENT
$ IN THIS PROBLEM, METERS, WATTS, AND DEGREES CELSIUS ARE USED
$ DEFINE GRID POINTS
GRID
                       Ο.
                               ٥.
                                       Ο.
GRID
       2
                       . 1
                               ٥.
                                       Ο.
GRID
        3
                       . 2
                               Ο.
                                       Ο.
GRID
        4
                       . з
GRID
        5
                       ٥.
                                       Ο.
                               . 1
GRID
        6
                       . 1
                                       ο.
GRID
       7
                       . 2
                               . 1
                                       Ο.
GRID
        8
                       .з
                                       Ο.
GRID
        9
                       Ο.
                               . 2
                                       Ο.
GRID
       10
                       ο.
                               - . 1
                                       ο.
GRID
       100
                       -.05
                               . 05
                                       Ο.
$ CONNECT GRID POINTS
CROD
       10
               100
                       10
                               2
CROD
       20
               100
                       9
                               6
CQUAD2 30
               200
                       1
                               2
                                       6
                                               5
CQUAD2 40
               200
                       2
                               3
CQUAD2 50
               200
                       3
$ DEFINE CROSS-SECTIONAL AREAS AND/OR THICKNESSES
PROD
       100
               1000
                       .001
PQUAD2 200
               1000
                       .01
$ DEFINE MATERIAL THERMAL CONDUCTIVITY
$
MAT4
      1000
               200.
                                                                      ALUMINUM
$
$ DEFINE CONVECTIVE AREA AND CONVECTIVE COEFFICIENT 'H'
                                                                      Same Park Company of the Same
$HBDY 60
               300
                       LINE
                                                                      +CONVEC
$CONVEC 100
               100
PHBDY
       300
               3000
                       .314
       3000
               200.
MAT4
$ DEFINE CONSTRAINTS
```

-1.

-1.

1 .,

\$ THE SPC CARD

300

300

300

100

200

300

400

500

600

700

400

SIGMA

MAXIT 8

273.15

.0001

5.685E-8

PHBDY 2000

TEMPD 400

PARAM TABS

PARAM EPSHT

SLOAD

SLOAD

SLOAD

\$ SPC1

\$

\$

CHBDY

CHBDY

CHBDY

CHBDY

CHBDY

CHBDY

\$

S TEMP

\$

PARAM

PARAM

5

4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 . 8. 4 4. 3 5 4. 6 8. 8. 7 8 4. \$ THE FOLLOWING BULK DATA CARDS WERE ADDED TO CONVERT PROBLEM ONE TO \$ PROBLEM TWO. THE ONLY BULK DATA CARD REMOVED FROM THE PREVIOUS SOLUTION WAS S THIS SPC1 CARD REPLACES THE SPC CARD REMOVED FROM ABOVE 1 100 \$ RADIATION BOUNDARY ELEMENTS 2000 AREA4 5 10 2000 AREA4 2 3 6 10 2000 AREA4 3 4 8 10 7 2000 AREA4 5 6 2 10 2000 AREA4 6 7 10 3 AREA4 2000 7 10 \$ EMISSIVITY OF RADIATING ELEMENT . 90 S ESTIMATE OF FINAL STEADY STATE SOLUTION VECTOR --- REFERENCED \$ BY TEMP(MATERIAL) IN CASE CONTROL 100 300. 300. \$ PARAMETERS CONTROLLING RADIATION LOADING AND THE ITERATION LOOPING

INPUT BULK DATA DECK ECHO

\$							
\$ DEFIN	ITION	OF THE RA	DIATION	MATRIX			
\$ ALL O	F THE	RADIATION	GOES TO	SPACE			
\$							
RADLST	200	300	400	500	600	700	
RADMIX	1	0.	ο.	Ο.	Ο.	ο.	0.
RADMTX	2	Ο.	Ο.	Ο.	Ο.	0.	
RADMTX	3	Ο.	٥.	Ο.	ο.		
RADMTX	4	٥.	Ο.	ο.			
RADMTX	5	Ο.	٥.				
RADMTX	6	٥.					
\$							

INPUT BULK DATA DECK ECHO

1 . 2 . 3 . 4 . 5 . 6 . 7 . 8 . 9 . 10 .
\$ THESE COMMENTS, WHICH DO NOT APPEAR IN THE VIEW RUN. APPLY TO CHANGES \$ MADE FOR PROBLEM TWELVE.
\$ THE BULK DATA DECK FOR PROBLEM TWO WAS INPUT DIRECTLY TO THE VIEW PROGRAM \$ WITH ONLY THREE CHANGES A \$VIEW CARD WAS ADDED. CHBDY CARDS
\$ 200 THROUGH 700 WERE REFERENCED TO THIS VIEW CARD BY PUNCHING THE VIEW CARD \$ NUMBER IN FIELD NINE, AND CHBDY CARD 60 AND ITS CONTINUATION CARD WERE
\$ REMOVED FROM THE DECK BY PLACING A \$ IM COLUMN ONE OF EACH CARD.
\$ IT SHOULD BE NOTED THAT THE \$VIEW CARD IS READ AS A COMMENT CARD BY NASTRAN. \$ BUT IS READ AS A DATA CARD BY THE VIEW PROGRAM. ALL OTHER CARDS BEGINNING
S WITH A S WHICH ARE FOUND IN THE VIEW PROGRAM ARE IGNORED. S NO VIEW FACTOR COMPUTATIONS WERE DESIRED FOR CHBDY CARD 60.
\$ ALSO, UNIT SEVEN HAS BEEN DIRECTED TO THE PRINTER SO THE RADMIX AND RADLST \$ CARDS PRODUCED MAY BE DIRECTLY VIEWED.
\$
\$VIEW 10 0 0 3 3 . \$
\$.**** * ADDED TO CONVERT PROBLEM TWELVE TO PROBLEM THIRTEEN AN
\$ ALTER HAS BEEN ADDED IN THE EXECUTIVE CONTROL, SOL 1 HAS BEEN CHANGED TO \$ SOL 3. PLOT REQUEST CAMDS HAVE BEEN
\$ ADDED TO THE CASE CONTROL. AND A SPECIAL VERSION OF THE NASTRAN PROGRAM
\$ HAS BEEN REQUESTED IN THE JOB CONTROL STATEMENTS. \$ ALSO NOTE THAT SOL 1 IS REQUESTED IN CASE CONTROL, AS THE ALTER
\$ IS DESIGNED FOR IT EXECUTION WILL TERMINATE AFTER THE PLOTS ARE PRODUCED.
\$ ************************************
\$ \$
ENDDATA

TOTAL COUNT= 133

*** USER INFORMATION MESSAGE 207, BULK DATA NOT SORTED.XSORT WILL RE-ORDER DECK.

			s c) R T E [) BU	LK D	ДТА	ECHO		
CARD										
COUNT	. 1	2	3	4	5	6	7	8	9	10 .
1 -	CHBDY	200	2000	AREA4	1	2	6	5	10	
2-	CHBDY	300	2000	AREA4	2	3	7	6	10	
3 -	CHBDY	400	2000	AREA4	3	4	8	7	10	
4 -	CHBDY	500	2000	AREA4	5	6	2	1	10	
5 -	CHBDY	600	2000	AREA4	6	7	3	2	10	
6-	CHBDY	700	200 0	AREA4	7	8	4	3	10	
7 -	CQUAD2	30	200	1	2	6	5	_		
8-	COUAD2	40	200	2	3	7	5 6			
9 -	CQUAD2	50	200	3	4	8	7			
10-	CROD	10	100	10	2	_	-			
11-	CROD	20	100	9	6					
12-	GRID	1		0.0	0.0	0.0				
13-	GRID	2		.1	0.0	0.0				
14-	GRID	3		. 2	0.0	0.0				
15-	GRID	4		.3	0.0	0.0				
16-	GRID	5		0.0	. 1	0.0				
17-	GRID	6		. 1	. i	0.0				
18-	GRID	7		.2	. i	0.0				
19-	GRID	8		.3	. 1	0.0				
20 -	GRID	9		0.0	. 2	0.0				
21-	GRID	10		0.0	1	0.0				
22-	GRID	100		05	. 05	0.0				
23-	MAT4	1000	200.	.00	. 03	0.0				ALUMINUM
24-	MAT4	3000	200.							W FOW THOM
25-	MPC	200	9	1	1.	5	•	- 4		
26-	MPC	200	10	1	1.	5 1	1	·1. ·1.		•
27-	PARAM	EPSHT	.0001	1	٠.	•	•	-1.		
28-	PARAM	MAXIT	8							
29 -	PARAM	SIGMA	5.685E	. 0						
30-	PARAM	TABS	273.15	- 0						
31 -	PHBDY	300	3000	.314						
32-	PHBCY	2000	3000	. 314	00					
33-			1000	0.4	. 90					
34 -	PQUAD2	200		.01						
35 -	PROD	100	1000	.001	500	600				
	RACLST	200	300	400	500	600	700			
36- 37-	RADMTX	1	0.0	0.0	0.0	0.0	0.0	0,0	٠.	** *** * **
	RADMIX	2	0.0	0.0	0.0	0.0	0.0			
38 -	RADMITX	3	0.0	0.0	0.0	0.0				
39 -	RADMTX	4	0.0	0.0	0.0					
40 -	RADMITX	5	0.0	0.0						
41-	RADMTX	6	0.0	_	_	_				
42-	SLOAD	300	1	4.	2	8.				•
43-	SLOAD	300	3	8.	4	4.				
44-	SLOAD	300	5	4.	6	8.				
45-	SLOAD	300	7	8.	8	4.				
46-	SPC1	100	1	100						
47- 48-	TEMP	400	100	300.						
44-	T [M]		000							
10	TEMPD ENDOATA	400	300.							

NASTRAN SOURCE PROGRAM COMPILATION DMAP-DMAP INSTRUCTION NO.

- *** USER WARNING MESSAGE 54.
 PARAMETER NAMED EPSHT NOT REFERENCED
- *** USER WARNING MESSAGE 54,
 PARAMETER NAMED MAXIT NOT REFERENCED
- *** USER WARNING MESSAGE 54.
 PARAMETER NAMED SIGMA NOT REFERENCED
- *** USER WARNING MESSAGE 54.
 PARAMETER NAMED TABS NOT REFERENCED

NO ERRORS FOUND - EXECUTE NASTRAN PROGRAM

MESSAGES FROM THE PLOT MODULE

PLOTTER DATA

THE FOLLOWING PLOTS ARE FOR AN SC 4020 PLOTTER

AN END-OF-FILE MARK FOLLOWS THE LAST PLOT

THE FOLLOWING PLOTS ARE REQUESTED ON PAPER ONLY

ENGINEERING DATA

ORTHOGRAPHIC PROJECTION

ROTATIONS (DEGREES) - GAMMA = 34.27, BETA = 23.17, ALPHA = 0.0, AXES = +X.+Y.+Z, SYMMETRIC SCALE (OBJECT-TO-PLOT SIZE) = 2.794795E 01

ORIGIN 1 - XO = -1.789886E-06, YO = -4.920804E 00(INCHES) LINEAR STEADY-STATE PROBLEM ... PLCT CHBDY CARDS JANUARY 13, 1976 NASTRAN 12/12/73 PAGE 10

MESSAGES FROM THE PLOT MODULE

PLOT 1 UNDEFORMED SHAPE

MESSAGES FROM THE PLOT MODULE

PLOTTER DATA

THE FOLLOWING PLOTS ARE FOR AN SC 4020 PLOTTER

AN END-OF-FILE MARK FOLLOWS THE LAST PLOT

THE FOLLOWING PLOTS ARE REQUESTED ON PAPER ONLY

ENGINEERING DATA

ORTHOGRAPHIC PROJECTION

ROTATIONS (DEGREES) - GAMMA = 34.27, BETA = 23.17, ALPHA = 0.0 , AXES = +X,+Y,+Z, SYMMETRIC SCALE (OBJECT-TO-PLOT SIZE) = 2.794795E 01

ORIGIN : - XO = -1.789886E-06, YO = -4.920804E OO (INCHES)

LINEAR STEADY-STATE PROBLEM ... PLOT CHBDY CARDS

JANUARY 13, 1976 NASTRAN 12/12/73 PAGE 12

MESSAGES FROM THE PLCT MODULE

UNDEFORMED SHAPE PLOT 2

MINIMARAN MARANCAN MARANCAN MARA

FARTHARDARANCOCONOCIASTA CONTROLAS C

I COMMISSIONE DE CONCENTRA DE CONTRA
М. В мужи повыменти возменти по применти п

MANAMANIA DIA KANTARAMANIANEN MINIMAKAN PANJARANA MANAMANJAMBANATANTANAN MINIMAKAN MIN

MILANGER MAN TO THE TOTAL A THE ATTENDANCE OF THE TOTAL AND A STREET OF THE TOTAL AND A STREET OF THE TOTAL AND A STREET OF THE ATTENDANCE OF THE TOTAL AND A STREET OF THE TO

MICHIGAGINAMARIA ACCUMMINAMAN MAGAZIZIO MORANGINA MAGAZIZIO MANAGANA MAGAZIZIO MAGAZIZ

MARKARANAMANA ARAWAS EMISAMBANG DAMBASANIKANDAN MENGHISIKANDIKANDIKAN MARKARANAMANAMANDIAN////
MARKARANAMANA ENGAMASE EMISAMBANAMA DAMBASANIKANDAN MARKANAMANAMANAMANAMANDIANAMA/////

MEMBERANDAN MATEMPAKAN MATEMPAKAN MATEMPAKAN MEMBERANDAN MEMBEMBANDAN MEMBERANDAN MEMBERAN

MEMPARANG GERES SERGAMMET TAK SEJAS KEREBAKKERANG MAND MEMANANGAMAMAM M//////MM - - MEMANG ARBAMMAM M//////MM - - MEMANG ARBAMMAM

MINIMA MMMM MMMAM MESMESIA /MM --MAA MMMMMM MARKATY MODEL MARKINEM MAMMAMMAMAM /// M MM - - MMM MMMM MMMM Mediamental MMMCINIG MANGGAMAGAM MMMMMM/// MMM MMM M MMM MM MMMMMMMMMMM MMEINIA MMERWAYS M 1/////// MM50M MM - - MM50MM MMMMMMM MMM MM MMM MMMMM MM ////MMM MMMM - - MMMMMM M MANMANAMA A1: RA MMMM// /// MMACASSAM MMM MMM MM MMMM MM MMMMMMM - - - M MNIMMMMM MMMMMMMM M DAMAGE MM MANAGEM MM MMMM MM MEMBERSHAM MM MKJ 1111 111 MMMMMMM MMMMMM M MMMM MM MMMMMMM MMMM MACAMINANIA / /// ///MM MINIMIMIMMM - - - M MANAGEMENT M MMM MMMMMMMMM MMMMM MMMMMMMMMM // M MMMMAH - - - MMMM MMMMM MMISSISSMM MM 11111 MMMM MMM - - - - MMMM M MMM MIMOSIMMM M MMM MM MMMM MM NM/////// MMMMM MMM MMCMSOMM MMMM MMMMMM MMMM MM ////NOMBASSASS MMMMM THY MM MINIMINA - - - - M MIM NAMED MEMBERSHIP MM MM

IBM 360-370 SERIES

RIGID FORMAT SERIES M

LEVEL 15 5.3

MODELS 91.95

SYSTEM GENERATION DATE - 12/31/74

MMM

MMMSBRIERWAN MMRESHINGER, MCCAN CHARF - - - MM MRESHINGERMANNERMERSHINGERM MARANES MARKET MAR

MMMMMMARARADIOCOM AMAGONDACORTARIOGOMINARADA (MEGARIAGO Y 2 - - - PONACIO COLO MAGONDACO MA MARAMANDELINIA MARAPANDA MAGONDA (MEGARIAGO Y COLO MAGONDA MAGONDA (MEGARIAGO Y 2 - - -) COLO MAGONDA MAG

MANAGA BANGBANA - - SAWARASA SAMADA MANAGAMAN

могулия - - етивакумую подобрания применяющим подобрания подобрани

MM - - HAMIOTACHE TOTAL MANIMENTAL PROPERTY OF THE TOTAL - МИМОРИНИ, ВИЗИТЕВЛИО НЕГОВОЛИТЕЛЬНО В ВИЗИТЕМИ В В ВИЗИТЕМИ В В ВИЗИТЕМИ В В ВИЗИТЕМИ В В ВИЗИТЕМИ В В ВИЗИТЕМИ В В ВИЗИТЕМИ В В ВИЗИТЕМИ В В ВИЗИТЕМИ В В ВИЗИТЕМИ В В В ВИЗИТЕМИ В В ВИ

MEANS OF THE SAME RESIDENCE OF THE SAME OF

MIMMIMMIMMIMMIMMIMMIMM

14-]

NASTRAN EXECUTIVE CONTROL DECK ÉCHO

CASE CONTROL DECK ECHO

```
CARD
COUNT
 1
                  · $\forall \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colon \colo
  2
                 $ END OF EXECUTIVE CONTROL --- START CASE CONTROL ***********************
  3
  5
                  5
                 TITLE: NCN-LINEAR TRANSIENT PROBLEM ... LARGE THERMAL MASS TO
  6
                  SUBTITLE = CONSTRAIN A GRID POINT TO A FIXED TEMPERATURE
  8
                 $ SPECIFY 51 LINES OF DATA PER PAGE (DOES NOT INCLUDE HEADINGS AT TOP OF PAGE)
  9
10
                  Ŧ.
                 LINE=51
11
12
13
                  $ REDUEST SORTED AND UNSORTED OUTPUT
                 $ IF THIS CARD IS OMITTED. ONLY THE SORTED BULK DATA WILL APPEAR
14
15
                 ECHO=BOTH
16
17
18
                 S SELECT THE MPC AND LOAD SETS TO BE USED IN THIS SOLUTION
19
                 $ NOTE THAT NO SPC SET IS SELECTED, AND THAT DLOAD HAS REPLACED LOAD.
20
                 MPC=200
21
22
                 DLOAD=300
23
24
                 $ SELECT THE TEMPERATURE SET WHICH IS AN ESTIMATE OF THE FINAL SOLUTION VECTOR
                 S THE SELECTION OF THIS SET IS OPTIONAL FOR SOL 9, BUT SHOULD BE MADE IF
25
                  $ THE FINAL TEMPERATURE IS SEVERAL HUNDRED DEGREES DIFFERENT FROM THE
26
27
                  $ IC VECTOR, AND RADIATIVE INTERCHANGES APE INCLUDED.
28
29
                 TEMP(MATERIAL)=400
30
                  S SELECT THE STEP SIZE. NUMBER OF INCREMENTS. AND PRINTOUT FREQUENCY
31
32
33
                 TSTEP=500
34
35
                  $ SELECT THE TEMPERATURE SET DEFINING THE TEMPERATURE VECTOR AT T=0.
35
37
                 1C=600
38
                 $
39
                 $ SELECT OUTPUT DESIRED
40
                 $
41
                 OUTPUT
42
43
                 S DEFINE A GROUP OF GRID POINTS TO BE REFERENCED BY AN OUTPUT REQUEST
44
45
                  SET 5 = 1,2,3,4,5,6,7,8,100
46
                  $ REFERENCE A PREVIOUSLY DEFINED GROUP OF GRID POINTS
47
48
49
                 THERMAL=5
50
```

14-4

NON-LINEAR TRANSIENT PROBLEM ... LARGE THERMAL MASS TO JANUARY 1, 1976 NASTRAN 12/31/74 PAGE 3
CONSTRAIN A GRID POINT TO A FIXED TEMPERATURE

CASE CONTROL DECK ECHO

CARD	
COUNT	
52	S END CASE CONTROL START BULK DATA **********************************
53	
54	\$
55	BEGIN BULK

INPUT BULK DATA DECK ECHO

```
1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 .
$ UNITS MUST BE CONSISTENT
S IN THIS PROBLEM, METERS, WATTS, AND DEGREES CELSIUS ARE USED
S DEFINE GRID POINTS
£
                                      Ο.
GRID
                       0.
GRID
                               0.
                                      Ο.
       2
                       . 1
                               Ο.
                                      Ο.
GRID
       3
                       . 2
GRID
       4
                       . З
                               Ο.
                                      ٥.
GRID
       5
                       0.
                               . 1
                                      ٥.
                                      Ο.
GRID
       6
                       . 1
                               . 1
GRID
       7
                       . 2
                               . 1
                                      Ο.
       8
                       . 3
                                      Ο.
GRID
                               . 1
GRID
                       0.
                               . 2
                                      0.
GRID
       10
                                      C.
                       - . 05
                               . 05
GRID
       100
$
S CONNECT GRID POINTS
S
CROD
       10
               100
                       10
CROD
       20
               100
                       9
                               6
CQUAD2 30
               200
                       1
                               2
                                      6
                                              5
CQUAD2 40
               200
                       2
                               3
                                      7
                                              6
               200
                       3
CQUAD2 50
$ DEFINE CROSS-SECTIONAL AREAS AND/OR TH.JKNESSES
                       .001
               1000
PROD
      100
PQUAD2 200
               1000
                       .01
S DEFINE MATERIAL THERMAL CONDUCTIVITY AND THERMAL MASS
$
                                                                      ALUMINUM
MAT4 1000
               200.
                       2.426+6
$ DEFINE CONVECTIVE AREA AND CONVECTIVE COEFFICIENT 'H'
                                                                      +CONVEC
CHEDY 60
               300
                       LINE
+CONVEC 100
               100
PHBDY
       300
               3000
                       . 314
        3000
               200.
MAT4
S DEFINE CONSTRAINTS
S
MPC
        200
               9
                       1
                              1.
                                              1
                                                      -1.
MPC
        200
               10
                                                      -1.
S DEFINE APPLIED LOADS
                               2
                                      8.
SLOAD 300
              1
                       4.
```

5

INPUT BULK DATA DECK ECHO 5 6 .. 7 .. 8 .. 9 .. 10 . . . SLOAD 300 3 8. 4 4. SLOAD 300 5 4. 6 8. SLOAD 300 7 8 8. 4. \$ THE FOLLOWING BULK DATA CARDS WERE ADDED TO CONVERT PROBLEM ONE TO \$ PROBLEM TWO. THE ONLY BULK DATA CARD REMOVED FROM THE PREVIOUS SOLUTION WAS \$ THE SPC CARD \$ THIS SPC1 CARD REPLACES THE SPC CARD REMOVED FROM ABOVE \$ SPC1 100 100 \$ RADIATION BOUNDARY ELEMENTS CHBDY AREA4 200 2000 CHBDY 300 2000 AREA4 2 CHBDY 400 2000 AREA4 7 CHBDY 500 2000 AREA4-5 1 CHBDY 600 2000 AREA4 6 2 CHBDY 2000 AREA4 700 \$ EMISSIVITY OF RADIATING ELEMENT \$ PHBDY 2000 90 \$ ESTIMATE OF FINAL STEADY STATE SOLUTION VECTOR --- REFERENCED \$ BY TEMP(MATERIAL) IN CASE CONTROL \$ TEMP 400 100 300. TEMPD 400 300. S \$ PARAMETERS CONTROLLING RADIATION LOADING AND THE ITERATION LOOPING \$ PARAM TABS 273.15 PARAM SIGMA 5.685E-8 PARAM MAXIT 8 PARAM EPSHT .0001 \$ DEFINITION OF THE RADIATION MATRIX \$ ALL OF THE RADIATION GOES TO SPACE RADLST 200 400 300 500 700 RADMTX 1 ٥. Ο. 0. ο. 0. Ο. RADMTX 2 ٥. Ο. ٥. ٥. Ο. RADMTX 3 ٥. Ο. 0. Ο. RADMTX 4 Ο. ٥. ٥. RADMTX 5 Ο. ٥. RADMTX 6

NON-LINEAR TRANSIENT PROBLEM ... LARGE THERMAL MASS TO

0.

CONSTRAIN A GRID POINT TO A FIXED TEMPERATURE

INPUT BULK DATA DECK ECHO

```
1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 .
S THE FOLLOWING BULK DATA CARDS WERE ADDED FOR THE TRANSIENT SOLUTION ------
$ THEY CONVERT PROBLEM TWO TO PROBLEM THREE
S NOTE THAT THE SPC1 SET WAS NOT SELECTED IN CASE CONTROL
S NOTE THAT SPCF OUTPUT IS NOT REQUESTED IN TRANSIENT
S NOTE THAT THERMAL MASS WAS ADDED TO 'MATA' CARD 1000
S NOTE THAT THE DIAG CARD IN THE EXECUTIVE CONTROL WAS IRRELEVANT
$ NOTE THAT THE LOAD REQUEST IN CASE CONTROL IS NOW A DLOAD REQUEST
$ TRANSIENT SINGLE POINT CONSTRAINT METHOD
$ CONSTRAIN GRID POINT 100 TO 300 DEGREES CELSIUS
$EL4S2 300
              1.+5
                      100
SLOAD 300
              100
                      300.+5
S DEFINES A CONSTANT LOAD SET APPLIED FROM T=0. TO T=1.+6 SECONDS
TLOAD2 300
                                                                  +TL1
                                            1 +6
+TI1 0.
              Ω.
S DEFINES THE NUMBER OF INCREMENTS. THE STEP SIZE AND THE PRINTOUT FREQUENCY
S REFERENCED IN CASE CONTROL AS 'TSTEP-'
S FACH TIME STEP IS 30 SECONDS
TSTEP 500
                      30.
                          1
$ DEFINES A TEMPERATURE VECTOR --- REFERENCED IN CASE CONTROL AS 'IC'
<
TEMPD 600
              300.
S TO CONVERT PROBLEM THREE TO PROBLEM FOURTEEN. A CELAS2 CARD AND AN SLOAD
$ CARD WERE REMOVED BY CONVERSION TO COMMENT CARDS (SEE ABOVE). AND
$ A CDAMP2 CARD HAS BEEN ADDED TO REPLACE THEM BY APPLYING A LARGE THERMAL MASS
S TO GRID POINT 100 TO FIX ITS TEMPERATURE. THE VALUE OF THE THERMAL MASS
S APPLIED IS ARBITRARY. BUT MUST BE MUCH LARGER THAN THAT APPLIED TO THE
$ OTHER GRID POINTS IN THE PROBLEM.
$ TO REDUCE THE OUTPUT VOLUME. THE ONLY OUTPUT REQUESTED IN THIS
$ RUN IS THERMAL=5
CDAMP2 70
              5.F+8 100
S
ENDDATA
```

PAGE

SORTED BULK DATA ECHO

			5 0	RIED	BUL	K DA	IAE	СНО			
CARD		_	_	_	_	_	_	_		_	
COUNT		. 2 .				. 6	7	В	• •	9	10
1 -	CDAMP2	70		100	1	_					
2 -	CHBDY	60	300	LINE	1	5					+CONVEC
3-	+CONVEC		100		_	_		_			
4 -	CHBDY	200	2000	AREA4	1	2	6	5			
5 -	CHEDY	300	2000	APEA4	2	3	7	6			
6 -	CHBDY	400	2000	APEA4	3	4	8	7			
7 -	CHBDY	500	2000	AREA4	5	6	2	1			
8-	CHBDY	600	2000	AREA4	6	7	3	2			
9-	CHEDA	700	2000	AREA4	7	8	4	3			
10-	CQUAD2	30	200	1	2	6	5				
11-	CQUAD2	40	200	2	3	7	6				
12-	CQUAD2	50	200	3	4	В	7				
13-	CROD	10	100	10	2						
14-	CROD	20	100	9	5						
15-	GRID	1		0.0	0.0	0.0					
16-	GRID	2		. 1	0.0	0.0					
17-	GRID	3		. 2	0.0	0.0					
18-	GRID	4		. 3	0.0	0.0					
19-	GRID	5		0.0	. 1	0.0					
20 - 21 -	GRID GRID	6 7		. 1 . 2	. 1	0.0					
22-	GRID	8		.2 .3	. 1	0.0 0.0					
23-	GRID	9		0.0	. 2	0.0					
24-	GRID	10		0.0	· 2 1	0.0					
25-	GRID	100		05	. 05	0.0					
26-	MAT4	1000	200.	2.426+6	.03	0.0					ALUMINUM
27-	MAT4	3000	200.	2.42010							A COM THOM
28-	MPC	200	9	1	1.		1	-1.			
29-	MPC	200	10	1	1.	1	1	-1.			
30-	PARAM	EPSHT	.0001	•	-						
31 -	PARAM	MAXIT	8								
32-	PARAM	SIGMA	5.685E-8	3							
33-	PARAM	TABS	273.15								
34-	PHBDY	300	3000	.314							
35-	PHEDY	2000			.90						
36-	PQUAD2	200	1000	.01							
37 -	PROD	100	1000	.001							
38 -	RADLST	200	300	400	500	600	700				
39 -	RADMTX	1	0.0	0.0	0.0	0.0	0.0	0.0			
40-	RADMTX	2	0.0	0.0	0.0	0.0	0.0				
41 -	RADMTX	3	0.0	0.0	0.0	0.0					
42-	XTMCAR	4	0.0	0.0	0.0						
43 -	RADMIX	5	0.0	0.0							
44-	RADMTX	6	0.0		_						
45 -	SLOAD	300	1	4.	2	8.					
46 -	SLOAD	300	3	8.	4	4.					
47-	SLOAD	300	5 .	4.	6	8.					
48 -	SLOAD	300	7	8.	8	4.					
49-	SPC1	100	1	100							
50 - 51 -	TEMP	400	100	300.							
51 -	TEMPD	400	300.								

NON-LINEAR TRANSIENT PROBLEM ... LARGE THERMAL MASS TO JANUARY 1, 1976 NASTRAN 12/31/74 PAGE CONSTRAIN A GRID POINT TO A FIXED TEMPERATURE

				S O R'T	E D	BULK	D A	TΑ	ECHO		
CARD											
COUNT	. 1	2		3	4	5	6.	. 7	8	9	10 .
52-	TEMPD	600	300.								
53-	TLOAD2	300	300			Ο.	0	1.+6	0.0	0.0	+TL1
54-	+TL1	Ο.	0.								
55 -	TSTEP ENDDATA	500	45	30.	1						

JANUARY 1, 1976 NASTRAN 12/31/74

AGE

*** USER WARNING MESSAGE 54.

PARAMETER NAMED EPSHT NOT REFERENCED

*** USER WARNING MESSAGE 54.

PARAMETER NAMED MAXIT NOT REFERENCED

NO ERRORS FOUND - EXECUTE NASTRAN PROGRAM

*** USER INFORMATION MESSAGE FULL INTERNAL SPACE NODE AVAILABLE

*** USER INFORMATION MESSAGE . 6 ELEMENTS HAVE A TOTAL VIEW FACTOR (FA/A) LESS THAN 0.99

*** USER INFORMATION MESSAGE 3023.

8 = 3

C = 0 R = 2

*** USER INFORMATION MESSAGE 3027. SYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

*** USER INFORMATION MESSAGE 3028, B = 5 BBAR = 5 C = 3 CBAR = 1

*** USER INFORMATION MESSAGE 3027, UNSYMMETRIC REAL DECOMPOSITION TIME ESTIMATE 15 O SECONDS.

POINT-ID n 1

TEMPERATURE VECTOR

TIME	TYPE	VALUE
0.0	S	3.000000E 02
3.0000C0E 01	S	2.984949E 02
6.000000E 01 9.000000E 01	s s	2.959980E 02 2.938442E 02
9.000000E 01 1.200000E 02	S	2.938442E 02 2.919233E 02
1.500000E 02	5	2.901897E 02
1.600000E 02	S	2.8952088 02
2.100000E 02	S	2 872021E 02
2.400000E 02	S	2.859211E 02
2.700000E 02	S	2.8476642 02
3.000000E 02	S	2.837268E 02
3,3000CGE G2	S	2.827922E 02
3.6000CCE 02	S	2.819526E 02
3.900000E 02	S	2.811990E 02
4.200000E 02	s s	2.805227E 02
4.50000CE 02 4.600000E 02	3	2.799160E 02 2.793718E 02
.5.100000E 02	S S S S S	2.788840E 02
5.400000E 02	9	2.784465E 02
5.700000E 02	Š	2.780542E 02
6.000000E 02	S	2.777024E 02
6.300000E 02	S	2.773807E 02
6.600000E 02	S	2.771035E 02
6.900000E 02	S	2.768496E 02
7.2000COE 02	S	2.766218E 02
7.500000E 02	s s	2.764172E 02
7.800000E 02 8.100000E 02	S	2.762339E 02 2.760691E 02
8.100000E 02 8.400000E 02	S	2.759214E 02
8.700000E 02	S	2.757886E 02
9.00000CE 02	Š	2.756694E 02
9.300000E 02	S	2.7556255 02
9.600000E 02	S	2.754663E 02
9.900000E 02	S	2.753799E 02
1.020000E 03	s s	2.753022E 02
1.050000E 03	S	2.752327E 02
1.080000E 03	s s	2.751699E 02
1.110000E 03	S S	2.751138E 02
1.140000E 03	5 S	2.750632E 02
1,170000E 03 1,200000E 03	S	2.750178E 02 2.749768E 02
1.230000E 03	S	2.749708E 02 2.749402E 02
1.260000E 03	s	2.749072E 02
1.290000E 03	š	2.748774E 02
1.320000E 03	s	2.748508E 02
1.350000E 03	S	2.748267E 02

POINT-ID =

TEMPERATURE VECTOR

TIME	TYPE	VALUE
0.0		3.000000E 02
3.000000E 01	S S	2.973813E 02
6.000000E 01	S	2.927502E 02
9.00000E 01	S	2.884054E 02
1.200000E 02	S	2.844219E 02
1.500000E 02	S	2.807952E 02
1.800000E 02 2.100000E 02	s s s	2.775146E 02 2.745569E 02
2.100000E 02 2.400000E 02	5	2.745569E 02 2.718953E 02
2.700000E 02	S	2.718953E 02 2.695037E 02
3.000000E 02	5	2.673567E 02
3.300000E 02	s s	2.654304E 02
3.600000E 02	S	2.637029E 02
3.900000E 02	S S	2.6215418 02
4.200000E 02	S	2.6076565 02
4.500000E 02	S	2.595210E 02
4.800000E 02	S S S	2.584053E 02
5.100000E 02 5.400000E 02	S	2.574050E 02
5.400000E 02 5.700000E 02	s s	2.565083E 02 2.557045E 02
6.000000E 02	S	2.549837E 02
6.30000E 02	S	2 543372E 02
6.600000E 02	Š	2.537573E 02
6.900000E 02	S	2.532370E 02
7.200000E 02	S	2.527702E 02
7.500000E 02	S	2,523514E 02
7.800000E 02	S	2.519754E 02
8.100000E 02	S	2.516379E 02
8.400000E 02 8.700000E 02	s s	2.5:3350E 02 2.5:0630E 02
9.000000E 02	5 S	2.510630E 02 2.508188E 02
9.300000E 02	S	2.505995E 02
9.600000E 02	Š	2.504025E 02
9.900000E 02	s	2.502256E 02
1.02000GE 03	S	2.500667E 02
1.050000E U3	S	2.499239E 02
1.0800605 03	5	2.497956E 02
1.110000E 03	S	2.496803E 02
1.140000E 03	5	2.495768E 02
1.170000E 03 1.200000E 03	s s	2.494837E 02 2.494001E 02
1.230000E 03	S	2.493250E 02
1.260000E 03	s s s	2.492574E 02
1.2900G0E 03	š	2.491967E 02
1.3200COE 03	S	2.491422E 02
1.350000E 03	S	2.490932E 02

PAGE

POINT-ID = 3

TIME	TYPE	VALUE	
0.0	S	3.000000E	02
3.000000E 0		2.942329E	02
6.000000E 0	1 S	2.847380E	02
9.0000008 0		2.767437E	02
1.200000E 0		2.658711E	02
1.500000E 0	2 S	2.638923E	02
1.800000E 0	2 S	2.586531E	02
2.100000E 0	2 S	2.540391E	02
2.400000E 0	2 \$	2.493606E	02
2.700000E 0	2 S	2.463456E	02
3.000000E 0		2.431343E	02
3.300000E 0		2.402764E	02
3.600000E 0	2 S	2.377292E	02
3.900000E 0		2.354560E	02
4.200000E 0		2.334251E	02
4.5000CCE 0	2 \$	2.316092E	02
4.800000E 0	2 5 2 5 2 5	2.299842E	02
5.100000E 0	2 S	2.285292E	02
5.400000E 0	2 S	2.272257E	02
5.7000G0E 0	2 S		02
6.000000E 0		2.250096E	02
6.300000E 0		2.240700E	02
6.6000COE 0		2.232269E	02
6.9000COE 0		2.224703E	02
7.200000E 0		2.217912E	02
7.5000CE 0		2.2:1814E	02
7.8000GCE C		2.206339E	02
8.1000U0E 0		2.201422E	C2
B.450000E 0		2.197005E	02
B.7CODCCE O		2.19303BE	02
9.000000E 0			02
9.300000E 0	2 5	2.1862725	02
9.6000005 0	2 S	2.183396E	02
9.900000E 0	2 S	2.180811E	02
1.020000E 0		2.178488E	02
1.0500CCE 0		2.1764018	02
1.080000E 0		2.174525E	02
1.110000E 0	3 S		02
1.140000E 0	3 S	2.171325E	02
1.1700COE 0	3 S		02
1.200000E 0	3 S		02
1.230000E 0			02
1.260000E 0			02
1.290000E 0			02
1.320000E 0			02
1.350000E 0	3 S	2.164245E	02

TIME	TYPE	VALUE
0.0	5 5	3.000000E 02
3.000000E 01		2.939604E 02
6.000000E 01	S	2.836946E 02
9.0000COE 01	S	2.746729E 02
1.200000E 02	S	2.668035E 02
1.500000E 02	S	2.599419E 02 2.539440E 02
1.800000E 02 2.100000E 02	s s	2.539440E 02 2.486829E 02
2.400000E 02	S	2.440519E 02
2.700000E 02	Š	2.399627E 02
3.00000CE 02	s	2.363417E 02
3.300000E 02	S	2.331274E 02
3.6000QOE 02	s s	2.302685E 02
3.900000E 02	S	2.277213E 02
4.200000E 02	S	2.254484E 02
4.500000E 02 4.600000E 02	S S	2.234181E 02 2.216025E 02
5.100000E 02	5	2.216025E 02 2.199775E 02
5.400000E 02	S S	2.185221E 02
5.70000GE 02	Š	2.172180E 02
6.000000E 02	s	2.160487E 02
6.300000E 02	S	2.150000E 02
6.600000E 02	S	2,140591E 02
6.90000E 02	S	2.132146E 02
7.203000E 02	S	2.124564E 02
7.500000E 02 7.800000E 02	s s	2.117757E 02 2.111643E 02
8.100000E 02		2.106151E 02
8.4000COE 02	s s	2.101221E 02
8.700000E 02	S	2.096790E 02
9.000000E 02	S	2.092809E 02
9.300000E 02	S S	2.089232E 02
9.600000E 02	S	2.086018E 02
9.900000E 02	s s s	2.083130E 02
1.020000E 03	S	2.080534E 02
1.050000E 03	5	2.078201E 02
1.080000E 03 1.110000E 03	s s	2.076105E 02 2.074220E 02
1.140000E 03	S	2.074220E 02 2.072528E 02
1.170000E 03	Š	2.071006E 02
1.200000E 03	S	2.069637E 02
1.230000E 03	S	2.068408E 02
1.260000E 03	5	2.067302E 02
1.290000E 03	Š	2.066308E 02
1.320000E 03	S	2.065414E 02
1.350000E 03	s	2.064612E 02

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POINT-ID =

TIME		TYPE	VALUE	
0.0		S		02
3.000000E	01	S		02
6.0CJ000E	01	S	2.959980E	02
9.000000E	01	S		02
1.200000E	02	S	2.919233E	02
1.5000COE	02	S	2.901897E	02
1.800000E	02	S		02
2.160000E	02	S		02
2.400000E	02	S		02
2.7000COE	02	S		02
3.0000COE	02	Š		02
3.300000E	02			02
3.600000E	02	Š		02
3.900000E	02	Š		02
4.2000COE	02	Š		02
4.500000E	02	:s		02
4.80JOCOE	02	s		02
5.100000E	02	S		02
	02	S		02
5.40J0C0E		S	2.784403E	02
5.700000E	02	S		
6.000000E	02	5		02
6.300000E	02	s s		02
6.6000CCE	02	S		C2
6.90JCCOE	02	S		02
7.200000E	02	S	2.766218E	02
7.5000COE	02	s	2.764175E	02
7.800000E	02	S	2.762339E	02
8.100000E	02	S		02
8.40000CE	02	S		02
8.7000COE	02	S		02
9.000000E	02	s	2.756694E	02
9.300000E	02	S	2.755625E	02
9.600000E	02	S	2.754663E	02
9.900000E	02	\$	2.753799E	02
1.020000E	03	S	2.753022E	02
1.050000E	03	S	2.752327E	02
1.0800005	03	S	2.751699E	02
1.110000E	03	S	2.751138E	02
1.140000E	03	s s	2.750632E	02
1.1700COE	03	S		02
1.200000E	03	S	2.749771E	02
1.230000E	03	s	2.749402E	02
1.260000E	03	\$ \$ \$ \$	2.749072E	02
1.290000E	03	Š		02
1.320000E	03	Š	2.748508E	02
1.350000E	03	S		02
1.350000	US	3	2.74020/E	U4

= CI-TNIC9

TIME	TYPE	VALUE
0.0 3.00000UE 01	s s	3.000000E 02 2.973613E 02
6.000000E 01 9.000000E 01	s s	2.9275G2E 02 2.884094E 02
1.200000E 02	S	2.844219E 02
1,500000E 02 1.800000E 02	s s	2.807952E 02 2.775146E 02
2.100000E 02 2.400000E 02	s s s	2.745569E 02 2.718953E 02
2.700000E 02	s s	2.695037E 02
3.000000E 02 3.300000E 02	S	2.673567E 02 2.654304E 02
3.600000E 02 3.900000E 02	s s	2.637029E 02 2.621541E 02
4.2000COE 02 4.5000COE 02	S	2.607656E 02 2.595210E 02
4.300000E 02	S	2.584053E 02
5.100000E 02 5.400000E 02	S S	2.574050E 02 2.565083E 02
5.700000E 02 6.000000E 02	S	2.557045E 02 2.549837E 02
6.300000E 02	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	2.543372E 02
6.600000E 02 6.900000E 02	5	2.537573E 02 2.532370E 02
7.200000E 02 7.500000E 02	S S	2.527702E 02 2.523513E 02
7.800000E 02 8.100000E 02	S	2.519755E 02 2.516380E 02
8.4000G0E 02	5	2.513350E 02
8.700000E 02 9.000000E 02	S S	2.510630E 02 2.508188E 02
9.3000COE 02 9.6000COE 02	s s s	2.505995E 02 2.504025E 02
9.9000C0E 02	S	2.502256E 02
1.020000E 03 1.050000E 03	S S	2.500667E 02 2.499239E 02
1.080000E 03 1.110000E 03	s s	2.497956E 02 2.496803E 02
1.140000E 03 1.170000E 03	S S	2.495768E 02 2.494838E 02
1.2000C0E 03	S	2.494001E 02
1.2300C0E 03 1.260000E 03	S S	2.493250E 02 2.492575E 02
1.290000E 03 1.320000E 03	S S	2.491968E 02 2.491422E 02
1.350000E 03.	Š	2.490931E 02

TIME	TYPE	VALUE
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6.000000E 01		2,847383E 02
9.000000E 01	S	2.767437E 02
1.200000E 02	_	2.698711E 02
1.500000E 02	S	2.638926E 02
1.800000E 02		2.586531E 02
2.100000E 02	, ,	2.5403905 02
2.400000E 02		2.499607E 02
2.7000CGE 02	, ,	2.463457E 02
3.000000E 02	, ,	2.431344E 02
3.300000E 02		2.402766E 02
3.6000000 02		2.377293E 02
3.900000E 02		
4.2000COE 02		2.354560E 02
		2.334252E 02
4.500000E 02	5	2.315094E C2
.4.600000E 02		2.239843E 02
5.100000E 02	5	2.285293E 02
5.4000C0E 02		2.272258E 02
5.70000CE 02	5	2.260574E 02
6.000000E 02		2.250098E 02
6.300000E 02		2.2407C1E 02
6.600000E 02	S	2.232270E 02
6.90JOOOE 02	S	2.224703E 02
7.2000COE 02		2.217912E 02
7.500000E 02		2.211814E 02
7.80J000E 02		2.206340E 02
8.100000E 02		2,201422E 02
8.40000E 02	S	2.197006E 02
8.700000E 02	5	2.193039E 02
9.000000E 02	S	2.189476E 02
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1.080000E 03	S	2.174526E 02
1.110000E 03	S	2.172840E 02
1.140000E 03	S	2.171326E 02
1.17JOOOE 03	S	2.169965E 02
1.200000E 03	S	2.168740E 02
1.23000SE 03	S	2.167640E 02
1.260000E 03	S	2.186652E 02
1.2900005 03	S	2.165762E 02
1.320000E 03	s s s s	2.164964E 02
1.350000E 03	S	2.164246E 02
	•	2.7042402 02

TIME	TYPE	VALUE
0.0 3.00000E 0	S 1 S	3.000000E 02 2.939607E 02
6.000000E 0	1 S	2.836948E 02 2.746731E 02
1.200000E 0	2 5	2.668037E 02
1.500000E 0	2 5	2.599419E 02 2.539441E 02
2.100000E 0	2 S	2.485829E 02
2.400000E 0 2.700000E 0	2 S 2 S	2.440520E 02 2.399627E 02
	2 5 2 S	2.363417E C2 2.331275E O2
3.600000E 0	2 5	2.302686E 02
	2 S	2.277214E 02 2.254486E 02
	12 S 12 S 12 S	2.234182E 02
5.100000E 0)2 S	2.216027E 02 2.199777E 02
)2 S	2.185223E 02 2.172180E 02
6.000000E 0)2 S	2.160488E 02
6.600000E 0)2 S)2 S)2 S	2.150001E 02 2.140592E 02
)2 S	2.132146E·02 2.124564E 02
7.500000E 0)2 . S	2.117757E 02
)2 S	2.111644E 02 2.106154E 02
)2 S	2.101221E 02 2.096791E 02
9.000000E 0)2 S	2.092810E 02
)2	2.089233E 02 2.086020E 02
	02 S 02 S 02 S 03 S	2.083131E 02
1.050000E 0		2.078203E 02
	03 5	2.076106E 02 2.074221E 02
1.140000E 0	13 S 13 S 13 S 13 S	2.072529E 02
1.200000E C)3 S	2.071007E 02 2.069639E 02
)3 S	2.068409E 02 2.067304E 02
1.290000E 0)3 S	2.066310E 02
)3 S	2.065415E 02 2.064614E 02

PAGE

6.300000E 02 S 2.999922E 02 6.600000E 02 S 2.999917E 02 7.200000E 02 S 2.999917E 02 7.500000E 02 S 2.999912E 02 7.500000E 02 S 2.999910E 02 8.100000E 02 S 2.999910E 02 8.40000E 02 S 2.999907E 02 8.40000E 02 S 2.999907E 02 8.70000E 02 S 2.999905E 02 9.000000E 02 S 2.999905E 02 9.300000E 02 S 2.999905E 02 9.300000E 02 S 2.999900E 02 9.600000E 02 S 2.999896E 02 9.90000E 03 S 2.999888E 02 1.050000E 03 S 2.999885E 02 1.110000E 03 S 2.999885E 02 1.110000E 03 S 2.999885E 02 1.170000E 03 S 2.999887E 02 1.170000E 03 S 2.999887E 02	6.300000E 02 S 2.999922E 02 6.600000E 02 S 2.999917E 02 7.200000E 02 S 2.999912E 02 7.500000E 02 S 2.999910E 02 7.500000E 02 S 2.999910E 02 8.100000E 02 S 2.999910E 02 8.400000E 02 S 2.999905E 02 8.700000E 02 S 2.999905E 02 8.700000E 02 S 2.999905E 02 9.000000E 02 S 2.999905E 02 9.300000E 02 S 2.999905E 02 9.300000E 02 S 2.999905E 02 9.300000E 02 S 2.999897E 02 9.500000E 02 S 2.99983E 02 1.020000E 03 S 2.999888E 02 1.050000E 03 S 2.999888E 02 1.140000E 03 S 2.999883E 02 1.170000E 03 S 2.999888E 02	TIME 0.0 3.000000E 6.00000E 9.000000E 1.20000E 1.50000E 2.10000E 2.40000E 3.00000E 3.00000E 4.20000E 4.20000E 4.50000E 5.10000E 5.40600E 5.70000E	01 01 02 02 02 02 02 02 02 02 02 02 02 02 02	E P n n n n n n n n n n n n n n n n n n n	VALUE 3.0C0000E 02 2.990905E 02 2.999955E 02 2.999955E 02 2.959976E 02 2.959976E 02 2.959966E 02 2.959966E 02 2.959956E 02 2.959956E 02 2.959956E 02 2.959956E 02 2.95994E 02 2.95994E 02 2.95994E 02 2.95993E 02 2.95993E 02 2.95993E 02 2.95993E 02 2.95993E 02 2.95993E 02	
7.500000E 02 S 2.999910E 02 8.100000E 02 S 2.999905E 02 8.400000E 02 S 2.999905E 02 8.700000E 02 S 2.999905E 02 9.000000E 02 S 2.999909E 02 9.300000E 02 S 2.999897E 02 9.500000E 02 S 2.999635E 02 9.500000E 02 S 2.99963E 02 1.020000E 03 S 2.999683E 02 1.050000E 03 S 2.999888E 02 1.080000E 03 S 2.999885E 02 1.110000E 03 S 2.999883E 02 1.117000E 03 S 2.999883E 02 1.170000E 03 S 2.999888E 02 1.170000E 03 S 2.999888E 02 1.170000E 03 S 2.999888E 02	7.500000E 02 S 2.999910E 02 8.100000E 02 S 2.999905E 02 8.700000E 02 S 2.999905E 02 8.700000E 02 S 2.999905E 02 9.000000E 02 S 2.999900E 02 9.300000E 02 S 2.999903E 02 9.900000E 02 S 2.99983E 02 9.900000E 03 S 2.99988E 02 1.020000E 03 S 2.99988E 02 1.080000E 03 S 2.99988E 02 1.110000E 03 S 2.99988E 02 1.110000E 03 S 2.99988E 02 1.170000E 03 S 2.99988E 02 1.120000E 03 S 2.99988E 02 1.20000E 03 S 2.99987E 02 1.20000E 03 S 2.99986EE 02			\$ \$ \$	2.999922E 02	
8.100000E 02 S 2.999907E 02 8.40000E 02 S 2.999905E 02 8.700000E 02 S 2.999902E 02 9.00000E 02 S 2.999902E 02 9.300000E 02 S 2.999907E 02 9.600000E 02 S 2.999635E 02 9.900000E 02 S 2.999635E 02 1.020000E 03 S 2.999890E 02 1.050000E 03 S 2.999888E 02 1.080000E 03 S 2.999888E 02 1.110000E 03 S 2.999888E 02 1.1170000E 03 S 2.999888E 02 1.1170000E 03 S 2.999888E 02 1.170000E 03 S 2.9998890E 02 1.170000E 03 S 2.9998890E 02 1.170000E 03 S 2.9998890E 02	8.100000E 02 S 2.999907E 02 8.40000E 02 S 2.999905E 02 8.700000E 02 S 2.999902E 02 9.00000E 02 S 2.997902E 02 9.30000E 02 S 2.997902E 02 9.30000E 02 S 2.99983FE 02 9.50000E 02 S 2.99983E 02 1.020000E 03 S 2.999883E 02 1.05000E 03 S 2.999888E 02 1.08000E 03 S 2.999888E 02 1.11000E 03 S 2.999888E 02 1.11000E 03 S 2.999888E 02 1.17000E 03 S 2.999888E 02 1.17000E 03 S 2.99987E 02 1.20000E 03 S 2.99987E 02	6.900000E 7.200000E 7.500000E	02 02 02	s s s	2.999917E 02 2.999915E 02 2.999912E 02	
9.300000E 02 S 2.999897E 02 9.600000E 02 S 2.99963E 02 9.900000E 02 S 2.999693E 02 1.020000E 03 S 2.999888E 02 1.080000E 03 S 2.999888E 02 1.110000E 03 S 2.999883E 02 1.110000E 03 S 2.999883E 02 1.140000E 03 S 2.99987E 02 1.170000E 03 S 2.99987E 02 1.200000E 03 S 2.99987E 02	9.300000E 02 S 2.999897E 02 9.600000E 02 S 2.99963E 02 9.900000E 02 S 2.999693E 02 1.020000E 03 S 2.999688E 02 1.050000E 03 S 2.999688E 02 1.110000E 03 S 2.999888E 02 1.110000E 03 S 2.999889E 02 1.170000E 03 S 2.999889E 02 1.170000E 03 S 2.99987BE 02 1.200000E 03 S 2.999675E 02 1.200000E 03 S 2.999675E 02 1.200000E 03 S 2.99987BE 02 1.260000E 03 S 2.99987BE 02 1.260000E 03 S 2.99987BE 02 1.260000E 03 S 2.99987BE 02 1.299000E 03 S 2.99987BE 02	8.100000E 8.400000E 8.700000E	02 02	s s s	2.999907E 02 2.999905E 02	
1.020000E 03 S 2.999890E C2 1.050000E 03 S 2.999888E 02 1.080000E 03 S 2.999885E 02 1.110000E 03 S 2.999883E 02 1.140000E 03 S 2.99980E 02 1.170000E 03 S 2.999878E 02 1.200000E 03 S 2.999875E 02	1.020000E 03 S 2.999890E 02 1.050000E 03 S 2.999888E 02 1.080000E 03 S 2.999885E 02 1.110000E 03 S 2.999885E 02 1.140000E 03 S 2.999878E 02 1.170000E 03 S 2.999878E 02 1.200000E 03 S 2.999675E 02 1.20000E 03 S 2.999871E 02 1.260000E 03 S 2.999871E 02 1.260000E 03 S 2.999866E 02 1.320000E 03 S 2.999866E 02	9.300000E 9.600000E	02 02	s s	2.999897E 02 2.999835E 02	
1.140000E 03	1.140000E 03 S 2.999680E 02 1.170000E 03 S 2.999878E 02 1.200000E 03 S 2.999675E 02 1.230000E 03 S 2.999673E 02 1.260000E 03 S 2.999868E 02 1.320000E 03 S 2.999866E 02	1.020000E 1.050000E 1.080000E	03 03 03	S S S	2.999890E C2 2.999888E O2 2.999885E O2	
	1.290000E 03 S 2.999868E 02 1.320000E 03 S 2.999866E 02	1.140000E 1.170000E 1.200000E	03 03 03	S S S	2.999630E 02 2.999878E 02 2.999675E 02	

```
NASTRAN LOADED AT LOCATION 185F20
TIME TO GO = 59 CPU SEC., 298 I/O SEC.
                                                 BEGN
     O CPH-SEC.
                       O ELAPSED-SEC.
                                           SEM1
     O CPU-SEC.
                        O ELAPSED-SEC.
                                           SEMT
     1 CPU-SEC.
                       5 ELAPSED-SEC.
                                           NAST
     1 CPU-SEC.
                       6 ELAPSED-SEC.
                                           GNFI
     1 CPU-SEC.
                        6 ELAPSED-SEC.
                                           XCSA
     1 CPU-SEC.
                        9 ELAPSED-SEC.
                                           IFP1
     1 CPU-SEC.
                       12 ELAPSED-SEC.
                                           XSOR
     2 CPU-SEC.
                                                IFP
                       19 ELAPSED-SEC.
                                             DO
     2 CPU-SEC.
                       54 ELAPSED-SEC.
                                            END
                                                IFP
     2 CPU-SEC
                       34 ELAPSED-SEC.
                                           XGPI
     4 CPU-SEC.
                       42 F: ARSED-SEC.
                                           SEM1
                                                 END
      4 CPU-SEC.
                       42 ELAPSED-SEC.
                                                 LINKNSO2 ---
     22 I/O SEC.
LAST LINK DID NOT USE
                       40016 BYTES OF OPEN CORE
      4 CPU-SEC.
                       44 ELAPSED-SEC.
                                                 LINK END ---
      4 CPU-SEC.
                       44 FLARSED-SEC.
                                           XSFA
     4 CPU-SEC.
                       45 ELAPSED-SEC.
                                           XSFA
      4 CPU-SEC.
                       45 ELAPSED-SEC.
                                           3
                                                 GP1
                                                         BEGN
      4 CPU-SEC.
                                           3
                                                 GP1
                       51 ELAPSED-SEC.
                                                         END
      4 CPU-SEC.
                       53 ELAPSED-SEC.
                                           8
                                                 GP<sub>2</sub>
                                                         BEGN
      4 CPU-SEC.
                       54 ELAPSED-SEC.
                                           8
                                                 GP2
                                                         END
      4 CPU-SEC.
                                                 PLTSET
                       54 ELAPSED-SEC.
                                           10
                                                         BEGN
      5 CPU-SEC.
                       55 ELAPSED-SEC.
                                                 PLTSET
                                                         END
                                           10
                                                 PRIMSG
                                                         BEGN
      5 CPU-SEC.
                       56 ELAPSED-SEC.
                                           12
      5 CPU-SEC.
                       57 FLAPSED-SEC.
                                           12
                                                 PRIMSG
                                                         FND
      5 CPU-SEC.
                       57 ELAPSED-SEC.
                                                 SETVAL
                                                         BEGN
                                           13
      5 CPU-SEC.
                       57 ELAPSED-SEC.
                                           13
                                                 SETVAL
                                                         END
      5 CPU-SEC.
                       58 ELAPSED-SEC.
                                           21
                                                 GP3
                                                         BEGN
      5 CPU-SEC.
                       65 ELAPSED-SEC.
                                                 GP3
                                                         END
                                           21
      5 CPU-SEC.
                       65 ELAPSED-SEC.
                                                 T \Delta 1
                                                         BEGN
                                           23
                       77 ELAPSED-SEC.
                                                         END
      5 CPU-SEC.
                                           23
                                                 T \Delta 1
                                                 LINKNSO3 ---
      5 CPU-SEC.
                       79 ELAPSED-SEC.
     53 I/O SEC.
 LAST LINK DID NOT USE
                        82788 BYTES OF OPEN CORE
      5 CPU-SEC.
                       82 ELAPSED-SEC.
                                                LINK END ---
      5 CPU-SEC.
                       82 ELAPSED-SEC.
                                           27
                                                 SMA1
                                                         BEGN
      5 CPU-SEC.
                       86 ELAPSED-SEC.
                                           27
                                                  SMA1
                                                         END
      5 CPU-SEC.
                       87 ELAPSED-SEC.
                                                 SMA2
                                                          BEGN
                                           30
      5 CPU-SEC.
                                                          END
                       90 ELAPSED-SEC.
                                           30
                                                 SMA2
      5 CPU-SEC.
                       91 ELAPSED-SEC.
                                                 LINKNSO5 ---
     61 I/O SEC
 LAST LINK DID NOT USE 64268 BYTES OF OPEN CORE
                                                 LINK END ---
      6 CPU-SEC.
                       94 ELAPSED-SEC.
                                           ----
      6 CPU-SEC.
                       94 ELAPSED-SEC.
                                           35
                                                  RMG
                                                          BEGN
      6 CPU-SEC.
                       98 ELAPSED-SEC
                                           SDCO
                                                 MP
                                                 MP
      6 CPU-SEC.
                       98 ELAFSED-SEC.
                                           SDCO
      6 CPU-SEC.
                       99 ELAPSED-SEC.
                                           FBS
      5 CPU-SEC.
                      101 ELAPSED-SEC
                                            FBS
      6 CPU-SEC.
                      101 ELAPSED-SEC.
                                           MPYA
                                                 D
                                                  METHOD 2 NT.NBR PASSES = 1,EST. TIME =
                                                                                                0.0
                                           MPYA
      6 CPU-SEC.
                      102 ELAPSED-SEC.
                                                 D
      6 CPU-SEC.
                      102 ELAPSED-SEC.
                                            TRAN POSE
                                            TRAN POSE
      6 CPU-JEC.
                      103 ELAPSED-SEC.
      6 CPU-SEC.
                      104 ELAPSED-SEC.
                                            MPYA D
```

```
METHOD 2 NT.NER PASSES = 1.EST. TIME =
                                                                                             0.0
                                          G AYSM
     6 CPU-SEC
                     105 ELAPSED-SEC.
     7 CPU-SEC.
                     106 FLAPSED-SEC
                                          35 RMG
     7 CPU-SEC.
                                          ---- ! INKNS04 ---
                     108 F: APSED-SEC
    77 1/0 SEC
LAST LINK DID NOT USE 72525 BYTES OF OPEN CORE
                                         --- LINK END ---
     7 CPU-SEC
                    1:2 ELAPSED-SEC.
     7 CPU-SEC.
                     . 2 FLAPSED-SEC.
                                          40
                                              GP4
                                                        BEGN
     7 CPU-SEC.
                                               GP4
                                                        FND
                     115 FLAPSED-SEC
                                          40
     7 CPU-SEC.
                                                        REGN
                     1 6 ELAPSED-SEC.
                                          46
                                               GPSP
     7 CPU-SEC.
                     117 FLARSED-SEC.
                                          46
                                                GPSP
                                                        END
     7 CPU-SEC.
                     117 ELAPSED-SEC.
                                         ---- LINKNS14 ---
    86 I/O SEC.
LAST LINK DID NOT USE 117044 SYTES OF OPEN CORE
                                         ---- LINK END ---
     7 CPU-SEC.
                     121 FLAPSED-SEC.
                                          47 OFP BEGN
     7 CPU-SEC.
                     121 ELAPSED-SEC.
     7 CPU-SEC.
                     121 FLAPSED-SEC.
                                          47 OFP
                                                        END
                                          ---- IINKNS04 ---
     7 CPU-SEC
                     123 FLAPSED-SEC
    89 I/O SEC.
LAST LINK DID NOT USE 115664 BYTES OF OPEN CORE
     7 CPU-SEC.
                     126 ELAPSED-SEC.
                                          ---- IINX END ---
     7 CPU-SEC.
                     126 FLAPSED-SEC.
                                          51
                                                MCE1
                                                        BEGN
     7 CPU-SEC.
                     129 ELAPSED-SEC.
                                          51
                                                MCF1
                                                        END
                                          53
                                               MCE2
                                                        BEGN
     7 CPU-SEC.
                     129 ELAPSED-SEC.
     7 CPU-SEC.
                                          MPYA D
                     131 ELAPSED-SEC.
                                                METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                             0.0
     8 CPU-SEC.
                     132 ELAPSED-SEC.
                                          MPYA D
     8 CPU-SEC.
                                          MPYA D-
                     132 ELAPSED-SEC.
                                                METHOD 2 T .NER PASSES = 1.EST. TIME =
                                                                                             0.0
     a CPU-SEC.
                     134 FLAPSED-SEC.
                                          MPYA D
     B CPU-SEC.
                     134 FLAPSED-SEC.
                                          MPYA D
                                                METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                             0.0
     8 CPU-SEC.
                                          MPYA D
                     135 ELAPSED-SEC.
     a CPU-SEC.
                     137 ELAPSED-SEC.
                                          MPYA D
                                                METHOD 2 NT.NBR PASSES =
                                                                          1.EST. TIME =
                                                                                             0.0
     9 CPU-SEC.
                     139 ELAPSED-SEC.
                                          MPYA D
     9 CPU-SEC.
                     139 ELAPSED-SEC.
                                          MPYA D
                                                METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                             0.0
     9 CPU-SEC.
                     140 FLAPSED-SEC.
                                          MPYA D
     9 CPU-SEC.
                     140 FLAFSED-SEC.
                                          MPYA D
                                                METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                             0.0
     9 CPU-SEC.
                     142 ELAPSED-SEC.
                                          MPYA D
     9 CPU-SEC.
                     145 ELAPSED-SEC.
                                          MPYA D
                                                METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                              0.0
     10 CPU-SEC.
                     146 ELAPSED-SEC.
                                          MPYA D
                                          MPYA D
    10 CPU-SEC.
                     146 ELAPSED-SEC.
                                                METHOD 2 T .NBR PASSES = 1,EST. TIME =
                                                                                             0.0
     10 CPU-SEC.
                     149 ELAPSED-SEC.
                                          MPYA D
    10 CPU-SEC.
                     150 FLAPSED-SEC.
                                          MPYA D
                                                METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                             0.0
                                          MPYA D
    10 CFU-SEC.
                     151 ELAPSED-SEC.
    10 CPU-SEC.
                     151 ELAPSED-SEC.
                                          53
                                                MCE2
                                                        END
    10 CPL-SEC.
                     153 ELAPSED-SEC.
                                          XSFA
    11 CPU-SEC.
                     154 ELAPSED-SEC.
                                          XSFA
                     154 ELAPSED-SEC.
                                          ---- LINKNSO6 ---
    11 CPU-SEC.
   111 I/O SEC.
LAST LINK DID NOT USE 102132 BYTES OF OPEN CORE
                                          ---- LINK END ---
    11 CPU-SEC.
                     156 ELAPSED-SEC.
                                          75
                                                DPD
                                                        BEGN
    11 CPU-SEC.
                     156 ELAPSED-SEC.
                                          75
                                                DPD
                                                        END
    11 CPU-SEC.
                     102 ELAPSED-SEC.
    11 CPU-SEC.
                     165 ELAPSED-SEC.
                                          ---- LINKNS10 ---
≃ 120 I/O SEC.
LAST LINK DID NOT USE 116416 BYTES OF OPEN CORE
```

---- LINK END ---

* 11 CPU-SEC.

169 ELAPSED-SEC.

```
MTRXIN BEGN
   11 CPU-SEC.
                     169 ELAPSED-SEC.
                                          81
   11 CPU-SEC.
                     189 ELAPSED-SEC.
                                          81
                                                MTRXIN END
   11 CPU-SEC.
                     170 ELAPSED-SEC.
                                          83
                                                PARAM
                                                        BEGN
   11 CPU-SEC.
                     170 ELAPSED-SEC.
                                          83
                                                PARAM
                                                        END
   11 CPU-SEC.
                     171 ELAPSED-SEC.
                                          XSFA
   11 CPU-SEC.
                     172 ELAPSED-SEC.
                                          XSFA
                                          88
                                                GKAD
                                                        BEGN
   11 CPU-SEC.
                     172 ELAPSED-SEC.
                                                GKAD
                                                        END
   11 CPU-SEC.
                     174 ELAPSED-SEC.
                                          88
                     175 ELAPSED-SEC.
                                          ---- LINKNS05 ---
   11 CPU-SEC.
   127 I/O SEC.
LAST LINK DID NOT USE 117064 BYTES OF OPEN CORE
    11 CPU-SEC.
                     178 ELAPSED-SEC.
                                          ---- LINK END ---
                                          92
                                                TRLG
                                                        BEGN
    11 CPU-SEC.
                     178 ELAPSED-SEC.
                                          MPYA D
    12 CPU-SEC.
                     188 ELAPSED-SEC.
                                                METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                               0.0
   12 CPU-SEC.
                     189 ELAPSED-SEC.
                                          MPYA D
    12 CPU-SEC.
                     190 ELAPSED-SEC.
                                          MPYA D
                                                METHOD 2 NT.NBR PASSES = 1,EST. TIME =
                                                                                               0.0
                                          MPYA D
    12 CPU-SEC.
                     191 ELAPSED-SEC.
                                          MPYA
    12 CPU-SEC.
                     191 ELAPSED-SEC.
                                                METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                               0.0
                                          MPYA D
    12 CPU-SEC.
                     192 ELAPSED-SEC.
    12 CPU-SEC.
                     193 ELAPSED-SEC.
                                          MPYA D
                                                METHOD 2 NT, NBR PASSES = 1, EST. TIME =
                                                                                               0.0
                     194 ELAPSED-SEC.
                                          MPYA D
    13 CPU-SEC.
                                          92
                                              TRLG
                                                       END
    13 CPU-SEC.
                     194 ELAPSED-SEC.
    13 CPU-SEC.
                     195 ELAPSED-SEC.
                                          ---- LINKNS11 ---
   142 I/O SEC.
LAST LINK DID NOT USE 58180 BYTES OF OPEN CORE
    13 CPU-SEC.
                     197 ELAPSED-SEC.
                                          ---- LINK END ---
                                          97
                                                TRHT
    13 CPU-SEC.
                     197 ELAPSED-SEC.
                                                         BEGN
                                          DECO MP
    13 CPU-SEC.
                     200 ELAPSED-SEC.
                                          DECO MP
    13 CPU-SEC.
                     201 ELAPSED-SEC.
    15 CPU-SEC.
                     261 ELAPSED-SEC.
                                          97
                                                 TRHT
                                                         END
    15 CPU-SEC.
                     261 ELAPSED-SEC.
                                                LINKNS12 ---
   202 I/O SEC.
LAST LINK DID NOT USE 69268 BYTES OF OPEN CORE
                                          ---- LINK END ---
    15 CPU-SEC.
                     267 ELAPSED-SEC.
    15 CPU-SEC.
                     267 ELAPSED-SEC.
                                          99
                                                 VDR
                                                         BEGN
    15 CPU-SEC.
                     269 ELAPSED-SEC.
                                           99
                                                 VDR
                                                         END
    15 CPU-SEC.
                     269 ELAPSED-SEC.
                                                PARAM
                                                         BEGN
                                          111
    15 CPU-SEC.
                      270 ELAPSED-SEC.
                                           111
                                                 PARAM
                                                         END
                                           XSFA
    15 CPU-SEC.
                     270 ELAPSED-SEC.
    15 CPU-SEC.
                     271 ELAPSED-SEC.
                                           XSFA
                     271 ELAPSED-SEC.
    15 CPU-SEC.
                                           115
                                                 SDR1
                                                         BEGN
    15 CPU-SEC.
                     271 ELAPSED-SEC.
                                           MPYA
                                                D
                                                 METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                0.1
                                           MPYA D
    15 CPU-SEC.
                     272 ELAPSED-SEC.
    16 CPU-SEC.
                      275 ELAPSED-SEC.
                                           115 SDR1
                                                         END
    16 CPU-SEC.
                     2"5 ELAPSED-SEC.
                                           ---- LINKNSOB ---
   212 I/O SEC.
LAST LINK DID NOT USE 119096 BYTES OF OPEN CORE
                      279 ELAPSED-SEC.
                                           ---- LINK END ---
    16 CPU-SEC.
    16 CPU-SEC.
                      279 ELAPSED-SEC.
                                           118 PLTTRAN BEGN
    16 CPU-SEC.
                      282 ELAPSED-SEC.
                                                PLTTRAN END
                                           118
    16 CPU-SEC.
                      283 ELAPSED-SEC.
                                           ---- LINKNS13 ---
   215 I/O SEC.
LAST LINK DID NOT USE 114512 BYTES OF OPEN CORE
    16 CPU-SEC.
                      286 ELAPSED-SEC.
                                           ---- LINK END ---
    16 CPU-SEC.
                                           120 SDR2
                                                         BEGN
                      286 ELAPSED-SEC.
    16 CPU-SEC.
                      288 ELAPSED-SEC.
                                           120 SDR2
                                                         END
    16 CPU-SEC.
                      238 ELAPSED-SEC.
                                           ---- LINKNS14 ---
   222 I/O SEC.
LAST LINK DID NOT USE 66428 BYTES OF OPEN CORE
```

```
17 CPU-SEC.
                298 ELAPSED-SEC.
                              ---- LINK END ---
   17 CPU-SEC.
                298 ELAPSED-SEC.
                              121 SDR3 BEGN
                              121 SDR3
   17 CPU-SEC.
                303 ELAPSED-SEC.
                                         END
                              123 OFP BEGN
   17 CPU-SEC.
                3C3 ELAPSED-SEC.
                             123 OFP END
   18 CPU-SEC.
                334 ELAPSED-SEC.
                             130 XYTRAN BEGN
130 XYTRAN END
   18 CPU-SEC.
                335 ELAPSED-SEC.
   18 CPU-SEC.
                305 ELAPSED-SEC.
                              ---- LINKNSO2 ---
   18 CPU-SEC.
              335 ELAPSED-SEC.
■ 232 I/O SEC.
LAST LINK DID NOT USE 11408 BYTES OF OPEN CORE
  18 CPU-SEC. 348 ELAPSED-SEC. ---- LINK END ---
                             132 XYPLGT BEGN
  18 CPU-SEC.
              348 ELAPSED-SEC.
             348 ELAPSED-SEC. 132 XYPLOT END
  18 CPU-SEC.
* 18 CPU-SEC. 349 ELAPSED-SEC. 138 EXIT BEGN
= 234 I/O SEC.
LAST LINK DID NOT USE 97232 BYTES OF OPEN CORE
AMOUNT OF OPEN CORE NOT USED = 11K BYTES
```

ASMASSIMAMASIAMSISA DAMAMISAN

ACRESS OF TRANSPORTED AND ACCOUNT OF THE PROPERTY OF THE PROPE

THE SECURE AND ASSOCIATED TO CONTRACT AND ASSOCIATED SECURITIES. MARKET PROMOTER TO A STATE OF THE PROMOTE AND A MINISTERNAMENTAL PROGRAMMENTAL PROGRAMMENT AND THE STATE OF THE STATE INVESTIGATION OF THE DESCRIPTION OF THE PROPERTY OF THE PROPER NIM MACABANANTE DI BURGA. ACCURRENCE AND CONTROL MADE AND CONTROL AN MINISTER STUDENTIAL MARKIN MINISTER & VALCENISMS DECEMBRISHMENT ACCORDED ACCORDED AND 1///// MANAGEMENTANTIAN MANAGEMENTANTAN MANAGEMENTANTAN MANAGEMENTANTAN MANAGEMENTANTAN MANAGEMENTAN MA MMMMN MATRIAS VISIM IN INVASCIO DE MATRIAS A M MARMING AND ADMINISTRATION OF THE PROPERTY OF TO MODAL OF THE PROPERTY OF TH MINISTRA DE LA COMPANIA DEL COMPANIA DEL COMPANIA DE LA COMPANIA DEL COMPANIA DEL COMPANIA DEL COMPANIA DEL COMPANIA DE LA COMPANIA DEL COMPANIA D MB MMMDDANDONOSIGNOCAL RESEMBLICATION OF THE PROPERTY OF THE P MINIMENTAL MARCHINE - MARCHINE MINISTERNATION MARKATOM DOMESTICAL ASSESSMENT MMMMMMMMMMM /MM - -MMMMMM GW MMWHALAD MAIAMM MMMASIM / / / /// M Mtd - - 5085M MMM :AWA MANAGAM M. MALULIM MARIAM WAY - MARIAM

MIMAZIM SAMMININ M MMM MMMM MMMM MM PARAMEMANA AND A 11111111 MEAN MM MMM MMMMMM MASSINGESTAND M. MILIM MG6/8// /// ////MAGM MMMM - - SANDELINGM MMM-MMM M MMM M MMM MIM MIMMM WALLIAN LINGUA. MM Niid 1111 111 MM is a remaining the second of the second o MAINMAIMM 6.6 MEAM MM MMMM MASMAS MINA CHARLES TRANSPORTED MARKS MI / /// ///MM MEGRANOMERM - - - M MMMMAMM MMMMMMM MAMMAMA M MMM MM MANAGEMENT AND A STATE OF THE S 1//// 77 M MESIANISM - -- MMMM --- -- MISSISM REMOVEMENT . M 6383M MMMMMMMMMMMMM MM MM/////// MIMMARIA MINIMA MODEL MEMBER MARKET - - - MASSEM M. MOMM MMMSSMMM M ММ MMMM MM MMMM ///mmmmm MSSMM21NSA MSS MEMMAN - - - - M MM MMM MIGRAIM MM MM MMMM MMMMMM MMMM MM MEMBERSHAMMERSEN DEGEMENTALAM EMBERSHAM - - - MMMMERSHAMMERSHAMES MAKANIMENIMENSHAMMER MMM

МЕНДИКАЛИВЕНКИ ПОВИЛИВИ И ВЕЗИКИ В В ВИЗИКИ В В ВИЗИКИ В ВИЗИКИ В ВИЗИКИ В ВИЗИКИ В ВИЗИКИ В ВИЗИКИ В ВИЗИКИ В В ВИЗИКИ В MMMMMMMM - MINIMAMMMMMMMMMMM - - MESSISSIMM ASSOMINATE MANTARGEMENT AND ASSOCIATED ASSOCIATED ASSOCIATION ASSOCIATION AND ASSOCIATIONI

MMMMANAGARD CARRAMANT TRAVANCIAN - - - ARCOMPONION MINISTRACEARCA TO A CONTRACT TO A CONTRACTOR OF THE CONTRACTOR OF MARAMANIAM MAKURAM - PUNDAKAN MININGKAN MININGKAN MAKAMANIAM MAKUMMANA MAKUMANIAM MAKANIAM MAKUMANIAM MAKANIAM MAKANIAM MAKUMANIAM MAKUMANIAM MAKANIAM MMMMM of the DMM - - - to the DMM page of the Common and the Common of t

MICRORIO DE CONTROL DE TARGAS GARAGAM - - RUGAMACAS, A CANCINOMENSE SUBJECT CON MARKANA

MIGMENTALINATION FOR THE TABLE TO THE TABLE TO THE TOTAL CONTRACT OF THE TABLE TO T MM - - RUCHERING CO. ANNO FERM - PROMOTE ASSOCIATION OF PROMOTE STREET

- MMMCDARAN MEKARAGAK VERKICAR SEKANDARAN GIRANAK BARAN MARAMAKAN MENANGAN MEKARAMANA

MMMMAGAMOAR AGUSTAVIANDERSOANTS PARAMANTARIAMANTARIAMANTARIAMANTARIAMANTARIA NAMES OF THE PROPERTY OF THE P

NEW DOMINION OF THE PROPERTY O

MESSAMMMESAMMMESSAM

TEM 360-370 SERIES MODELS 91.95

RIGID FORMAT SERIES M

LEVEL 15.5.3

MMISMM MMMM MMMM

MM Мм MM MMMMMM MMMMM

11111

SYSTEM GENERATION DATE - 12/31/74

1

```
ID CLASS PROBLEM FIFTEEN, C.E. JACKSON
$ :MAXIMUM CPU TIME ALLOWED FOR THE JOB
TIME 10
$
$ THE THERMAL ANALYZER PORTION OF NASTRAN IS TO BE USED
$
APP HEAT
$
5 THE NON-LINEAR TRANSIENT SOLUTION ALGORITHM IS TO BE USED
SOL 9
$
$ REQUEST FOR DIAGNOSTIC WHICH PRINTS OUT CONVERGENCE_CRITERIA
$ PRODUCES OUTPUT ONLY FOR SOL 3
DIAG 18
CEND
```

```
CASE CONTROL DECK ECHO
```

```
CARD
COUNT
1
       $ END OF EXECUTIVE CONTROL --- START CASE CONTROL ***********************
       TITLE=
                  NON-LINEAR TRANSIENT ... MULTILAYER INSULATION BY EFFECTIVE E
       $ SPECIFY 51 LINES OF DATA PER PAGE (DOES NOT INCLUDE HEADINGS AT TOP OF PAGE)
9
10
       LINE=51
11
       $ REQUEST SORTED AND UNSORTED OUTPUT
12
13
       $ IF THIS CARD IS OMITTED, ONLY THE SORTED BULK DATA WILL APPEAR
14
15
       ECH0=B0TH
16
17
       $ SELECT THE MPC AND LOAD SETS TO BE USED IN THIS SOLUTION
18
       $ NOTE THAT NO SPC SET IS SELECTED. AND THAT DLOAD HAS REPLACED LOAD.
19
2C
       MPC=200
21
       DLOAD=300
22
23
       S SELECT THE TEMPERATURE SET WHICH IS AN ESTIMATE OF THE FINAL SOLUTION VECTOR
24
       $ THE SELECTION OF THIS SET IS OPTIONAL FOR SOL 9. BUT SHOULD BE MADE IF
25
       S THE FINAL TEMPERATURE IS SEVERAL HUNDRED DEGREES DIFFERENT FROM THE
       $ IC VECTOR, AND RADIATIVE INTERCHANGES ARE INCLUDED.
26
27
28
       TEMP(MATERIAL)=400
29
30
       $ SELECT THE STEP SIZE, NUMBER OF INCREMENTS, AND PRINTOUT FREQUENCY
31
32
       TSTEP=500
33
34
       $ SFLECT THE TEMPERATURE SET DEFINING THE TEMPERATURE VECTOR AT T≃O.
35
36
       IC=600
37
38
       $ SELECT OUTPUT DESIRED
39
40
       OUTPUT
41
42
       $ DEFINE A GROUP OF GRID POINTS TO BE REFERENCED BY AN OUTPUT REQUEST
43
44
       SET 5 = 1,2,3,4,5,6,7,8,100
45
       S REFERENCE A PREVIOUSLY DEFINED GROUP OF GRID POINTS
46
47
48
       THERMAL=5
49
50
       51
```

15-4

NON-LINEAR TRANSIENT ... MÚLTILAYER INSULATION BY EFFECTIVE JANUARY 1, 1976 NASTRAN 12/31/74 · PAGE 3

CASE CONTROL DECK ECHO

INPUT BULK DATA DECK ECHO

```
. 1 ., 2 ., 3 ., 4 ., 5 ., 6 ., 7 ., 8 ., 9 ., 10 .
$ UNITS MUST BE CONSISTENT
S IN THIS PROBLEM, METERS. WATTS, AND DEGREES CELSIUS ARE USED
$ DEFINE GRID POINTS
$
                               Ο.
GRID
                                       0.
                       Ο.
GRID
       2
                               Ο.
                                       Ο.
                       . 1
                       . 2
GRID
                                       ο.
GRID
                       . 3
                               Ο.
                                       Ο.
GRID
        5
                       ο.
                                       ο.
                               . 1
GRID
        6
                       . 1
                               . 1
                                       Ο.
GRID
       7
                       . 2
                               . 1
                                       Ο.
GRID
        8
                       . 3
                               . 1
                                       Ο.
GRID
       9
                       Ο.
                               . 2
                                       C.
GRID
       10
                       ٥.
                                       Ο.
                               - . 1
      100
                       - . 05
GRID
                               . 05
                                       ٥.
S CONNECT GRID POINTS
5.
CROD
      10
               100
                       10
                               2
CROD
       20
               100
                       9
                               6
CQUAD2 30
               200
                       1
                               2
                                       6
                                               5
COUAD2 40
               200
                       2
                               3
                                       7
                                               6
COUAD2 50
               200
                       3
S DEFINE CROSS-SECTIONAL AREAS AND/OR THICKNESSES
PROD 100
               1000
                       .001
PQUAD2 200
               1000
                       .01
S DEFINE MATERIAL THERMAL CONDUCTIVITY AND THERMAL MASS
MAT4 1000
               200.
                       2.426+6
                                                                      ALUMINUM
5 DEFINE CONVECTIVE AREA AND CONVECTIVE COEFFICIENT 'H'
               300
                       LINE 1
CHBDY 60
                                                                      +CONVEC
+CONVEC 100
               100
PHBDY 300
               3000
                       .314
MAT4
       3000
               200.
S DEFINE CONSTRAINTS
5
MPC
        200
                               1.
                                                      -1.
MPC
        200
               10
                       1
                               1.
                                                      -1.
S DEFINE APPLIED LOADS
SLOAD
                       4.
                               2
                                       8.
      300
               1
```

5

INPUT BULK DATA DECK ECHO

```
4 .. .5 ..
                                        6 .. 7 .. 8 .. 9 .. 10 .
SLOAD
       300
              3
                      8.
                             4
                                    4.
SLOAD
       300
              5
                      4.
                             6
                                    8.
SLOAD
       300
              7
                      8.
                             8
                                    4.
ŝ
$ THE FOLLOWING BULK DATA CARDS WERE ADDED TO CONVERT PROBLEM ONE TO
5 PROBLEM TWO. THE ONLY BULK DATA CARD REMOVED FROM THE PREVIOUS SOLUTION WAS
$ THE SPC CARD
$ THIS SPC1 CARD REPLACES THE SPC CARD REMOVED FROM ABOVE
$
SPC1
      100
                      100
            1
$
$ RADIATION BOUNDARY ELEMENTS
CHBDY
                      AREA4
       200
              2000
CHEDY
       300
              2000
                      AREA4
                             2
                                    3
                                            7
                                                   6
CHBDY
       400
               2000
                      AREA4
                             3
                                    Δ
CHBDY
       500
               2000
                      AREA4
                             5
                      AREA4
CHBDY
       600
               2000
                             6
                                            3
                                                   2
CHBDY
       700
               2000
                      AREA4
                                                   3
$
$ EMISSIVITY OF RADIATING ELEMENT
$
PHBDY 2000
                             .02
$ ESTIMATE OF FINAL STEADY STATE SOLUTION VECTOR --- REFERENCED
$ BY TEMP(MATERIAL) IN CASE CONTROL
TEMP
       400
               100
                      300.
TEMPD
      400
               300.
$
$ PARAMETERS CONTROLLING RADIATION LOADING AND THE ITERATION LOOPING
$
PARAM
       TABS
               273,15
              5.685E-8
PARAM
       SIGMA
PARAM
       MAXIT
               8
PARAM EPSHT
              .0001
$ DEFINITION OF THE RADIATION MATRIX
$ ALL OF THE RADIATION GOES TO SPACE
RADLST 200
               300
                      400
                              500
                                     600
                                            700
RADMTX 1
                      Ο.
               0.
                             0.
                                     ο.
                                            Ο.
                                                   Ο.
RADMTX 2
                      Ο.
               Ο.
                              ٥.
                                     ο.
                                            Ο.
RADMIX 3
               Ο.
                      ٥.
                             C.
                                     ο.
RADMIX 4
               ٥.
                      Ο.
                             Ο.
RADMTX 5
               0.
                      Ο.
RADMTX 6
               Ο.
$
```

INPUT BUIK DATA DECK ECHO

```
1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8. .. 9 .. 10 .
S THE FOLLOWING BUIK DATA CARDS WERE ADDED FOR THE TRANSIENT SOLUTION ------
S THEY CONVERT PROBLEM TWO TO PROBLEM THREE
S NOTE THAT THE SPC1 SET WAS NOT SELECTED IN CASE CONTROL
$ NOTE THAT SPCF OUTPUT IS NOT REQUESTED IN TRANSIENT
$ NOTE THAT THERMAL MASS WAS ADDED TO 'MAT4' CARD 1000
S NOTE THAT THE DIAG CARD IN THE EXECUTIVE CONTROL WAS IRRELEVANT
S NOTE THAT THE LOAD REQUEST IN CASE CON JOL IS NOW A DLOAD REQUEST
$ TRANSIENT SINGLE POINT CONSTRAINT METHOD
$ CONSTRAIN GRID POINT 100 TO 300 DEGREES CELSIUS
CELAS2 300
                      100
              1.+5
SLOAD 300
              100
                      300.+5
$ DEFINES A CONSTANT LOAD SET APPLIED FROM T=0. TO T=1.+6 SECONDS
                                                                   +TL1
TLOAD2 300
               300
                                     Ο.
                                             1.+6
                                                    0.
       Ο.
+TL1
               Ο.
$ DEFINES THE NUMBER OF INCREMENTS. THE STEP SIZE, AND THE PRINTOUT FREQUENCY
$ REFERENCED IN CASE CONTROL AS 'TSTEP'
$ EACH TIME STEP IS 30 SECONDS
TSTEP 500
               45
                      30.
                             1
S
$ DEFINES A TEMPERATURE VECTOR --- REFERENCED IN CASE CONTROL AS 'IC'
$
TEMPD 600
               300.
$ PROBLEM FIFTEEN WAS DERIVED DIRECTLY FROM PROBLEM THREE.
S PROBLEM FIFTEEN SIMULATES A BLANKET OF MULTILAYER INSULATION BEING PLACED
S ON BOTH SIDES OF THE RADIATING FIN. NO BULK DATA CARDS WERE ADDED. BUT
$ THE EMISSIVITY OF PHBDY CARD 2000 WAS CHANGED FROM .9 TO AN EFFECTIVE
$ EMISSIVITY OF .02. THIS WAS AN ARBITRARILY SELECTED VALUE WHICH IS OFTEN USED
$ FOR 5 TO 10 LAYER BLANKETS ... THE DETERMINATION OF THE PROPER VALUE
$ IS AN ANALYTICAL JOB WHICH IS BEYOND THE SCOPE OF THIS DOCUMENT.
$ TO REDUCE THE OUTPUT VOLUME, THE ONLY OUTPUT REQUESTED IN THIS
S RUN IS THERMAL=5
5
ENDDATA
```

TOTAL COUNT= 149

15-8

			s o	R T E'D	виь	K DA	т д	E	СНО	•			
CARD													
COUNT		2 .	. 3			6	7		. 8		9		10 .
1 -	CELAS2	300	1.+5	100	1								
2-	CHBDY	60	300	LINE	1	5						+C	ONVEC
3-	+CONVEC	100	100										
4 -	CHBDY	200	2000	AREA4	1	2	6	5	5				
5-	CHBDY	300	2000	AREA4	2	3	7	€	5				
6-	CHBDY	400	2000	APEA4	3	4	8		7				
7 -	CHBDY	500	2000	AREA4	5	6	2	1					
8-	CHBDY	600	2000	AREA4	6	7	3		2				
9-	CHEDY	700	2000	AREA4	7	8	4		3				
10-	CQUAD2	30	200	1	2	6	5	•					
11-	CQUAD2	40	200	2	3	7	6						
12-	CQUAD2	50	200	3	4	8	7						
13-	CROD	10	100	10	2	Ü	'						
14-	CROD	20	100	9	6								
15-	GRID	1	100	0.0	0.0	0.0							
16-	GRID	2		.1	0.0	0.0							
17-	GRID	3		. 2	0.0	0.0							
18-	GRID	4		.3	0.0	0.0							
19-	GRID	5		0.0	.1	0.0							
20-	GRID	6		.1	. 1	0.0							
21 -		7		. 2									
	GRID	8			. 1	0.0							
22-	GRID	9		. 3	. 1	0.0							
23-	GRID			0.0	. 2	0.0							
24-	GRID	10		0.0	1	0.0							
25 -	GRID	100		05	. 05	0.0							
26-	MAT4	1000	200.	2.426+6								AL	UMINUM
27-	MAT4	3000	200.			-							
28-	MPC	200	9	1	1.	5	1		-1.				
29-	MPC	200	10	1	1.	1	1		-1.				
30-	PARAM	EPSHT	. 0001										
31 -	PARAM	MAXIT	8										
32-	PARAM	SIGMA	5.685E-	8									
33-	PARAM	TABS	273.15										
34 -	PHBDY	300	3000	.314									
35-	PHEDY	2000			.02								
36-	PQUAD2	200	1000	.01									
37-	PROD	100	1000	.001									
38 -	RADLST	200	300	400	500	600	700						
39 -	RADMTX	1	0.0	0.0	0.0	0.0	0.0		0.0				
40 -	RADMTX	2	0.0	0.0	0.0	0.0	0.0						
41 -	RADMTX	3	0.0	0.0	0.0	0.0							
42-	RADMTX	4	0.0	0.0	0.0								
43 -	RADMTX	5	0.0	0.0									
44-	KIMCAR	6	0.0										
45 -	SLOAD	300	1	4.	2	8.							
46 -	SLOAD	300	3	8.	4	4.							
47 -	SLOAD	300	5	4.	6	8.							
48-	SLOAD	300	7	8.	8	Λ.							
49 -	SLCAD	300	100	300.+5									
50-	SPC1	100	1	100									
51 -	TEMP	400	100	300.									

NON-LINEAR TRANSIENT ... MULTILAYER INSULATION BY EFFECTIVE JANUARY 1, 1976 NASTRAN 12/31/74 PAGE 8

				S 0 F	₹ Т	E 0)	8	U	L	<	D	Α	ТА		E C i	10					
CARD																						
COUNT	. 1	2		з.,		4			5			6			7		8		9		10	
52-	TEMPD	400	300.																			
53-	TEMPD	600	300.																			
54-	TLOAD2	300	300							(0.0			1.+	6	0.0	כ	0.	0	+	TL1	
55-	+TŁ1	Ο.	Ο.																			
56-	TSTEP	500	45	3	30.		1															
	ENDDATA	7																				

NASTRAN SOURCE PROGRAM COMPILATION DMAP-DMAP INSTRUCTION NO.

*** USER WARNING MESSAGE 54,
PARAMETER NAMED EPCHT NOT REFERENCED

*** USER WARNING MESSAGE 54, PARAMETER NAMED MAXIT NOT REFERENCED

NO ERRORS FOUND - EXECUTE NASTRAN PROGRAM

*** USER INFORMATION MESSAGE FULL INTERNAL SPACE NODE AVAILABLE

*** USER INFORMATION MESSAGE 6 ELEMENTS HAVE A TOTAL VIEW FACTOR (FA/A) LESS THAN 0.99

*** USER INFORMATION MESSAGE 3023. B = 3
C = 0
R = 2

*** USER INFORMATION MESSAGE 3027, SYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

. .

*** USER INFORMATION MESSAGE 3028, B = 5 BBAR = 5 C = 3 CBAR = 1

*** USER INFORMATION MESSAGE 3027, UNSYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

TIME	TYPE	VALUE
0.0	. S	3.000000E 02
3.0000COE 0		3.002195E 02
6.000000E 0		3.005920E 02
9.000000E 0		3.009275E 02
.1.200000E 0		3.012410E 02
1.500000E 0		3.015374E 02
1.500000E 02 2.100000E 02		3.018186E 02 3.020854E 02
2.100000E 0: 2.400000E 0:		3.020854E 02 3.023384E 02
2.700000E 0		3.025776E 02
3.000000E 0		3.028037E 02
3.300000E 0		3.030168E 02
3.600000E 0		3.032180E 02
3.90J000E 0		3.034072E 02
4.200000E 0		3.035854E 02
4.500000E 0		3.037529E 02
4.800000E 0		3.039106E 02
5.100000E 0	2 S	3.040586E 02
5.400000E 0	2 \$	3.041978E 02
5.700000E 0		3.043284E 02
6.000000E 0		3.044509E 02
6.300000E 0		3.045662E 02
6.600000E 0		3.046743E 02
6.900000E 0		3.047759E 02
7.200000E 0		3.048711E 02
7.5000COE 0		3.049604E'02
7.600000E 0	2 S	3.050442E 02
8.100000E 0		3.051228E 02
8.400000E 0: 8.700000E 0:		3.051968E 02 3.052661E 02
9.000000E 0		3.053311E 02
9.300000E 0		3.053921E 02
9.600000E 0		3.054492E 02
9.900000E 0		3.055029E 02
1.020000E 0		3.055532E 02
1.050000E 0		3.056006E 02
1.080000E 0		3.056450E 02
1.110000E 0		3.056865E 02
1.140000E 0		3.057256E 02
1.1700COE 03	3 S	3.057622E 02
1.200000E 0	3 S	3.057905E 02
1.230000E 0		3.058289E 02
1.260000E 0		3.058591E 02
1.290000E 0		3.058875E 02
1.320000E 0		3.059141E 02
1.350000E 0	3 S	3.059390E 02

POINT-ID = 2

TIME	TYPE	SUJAY
0.0 3.000000E 01	s s	3.000000E 02 3.000853E 02
6.000000E 01	Š	3.010850E 02
9.000000E 01	S	3.017725E 02
1.200000E 02	S	3.024348E 02
1.500000E 02 1.800000E 02	S S	3.030674E 02 3.033685E 02
2.100000E 02		3.042378E 02
2.400000E 02		3.047759E 02
2.700000E 02 3.000000E 02		3.052937E 02 3.057625E 02
3.300000E 02		3.057525E 02 3.062136E 02
3.600000E 02	S	3.066382E 02
3.900000E 02		3.070376E 02
4.200000E 02 4.500000E 02		3.674131E 02 3.677659E 02
4.800000E 02		3.0809748 02
5.100000E 02	S	3.084087E 02
5.400000E G2	S	3.087012E 02
5.7C00C0E 02 6.0000C0E 02		3.089756E 02 3.092334E 02
6.300000E 02		3.094753E 02
6.600000E 02	S	3.0970245 02
6.900000E 02	S	3.699155E 02
7.200000E 02 7.500000E 02	9 9	3.101155E 02 3.103030E 02
7.800000E 02	S	3.104790E 02
8.100000E 02	? S	3.106443E 02
8.400000E 02	2 5	3.107993E 02
8.700000E 02 9.000000E 03		3.109446E 02 3.110811E 02
9.300000E 02	\$ 5	3.112090E 02
9.600000E 02	? S	3.113291E 02
9.900000E 02		3.114417E 02
1.020000E 03		3.115474E 02 3.116465E 02
1.080000E 03	s s	3.117395E C2
1.110000E 03	3 S	3.118269E 02
1.140000E 03	3 S	3.119087E 02
1.170000E 03	3 5	3.119854E 02 3.120574E 02
1.230000E 03		3.121250E 02
1.260000E 03	3 S	3.121885E 02
1.290000E 03	3 S	3.1224808 02
1.320000E 03	3 S	3.123040E 02 3.123562E 02

TIME	TYPE	VALUE
0.0		3.000000E 02
3.000000E 01	\$ \$	3.008613E 02
	3	
6.000000E 01	5	3.023389E 02
9.000000E 01	5	3.C36787E 02
1.2000COE 02	S	3.049131E 02
1.500000E 02	S	3.060588E 02
1.8C0000E 02	č	3.C71262E 02
	ž	3.081226E 02
2.1000COE 02	5 5 5 5 5 5 5 5 5 5	
2.400000E 02	5	3.090537E 02
2.700000E 02	S	3.099248E 02
3.000000E 02	S	3.107400E 02
3.300000E 02	S	3,115034E 02
3.600000E 02	5	3.122185E 02
	Š	
3.900000E 02	5	
4.200000E 02	5	3.135164E 02
4.500000E 02	5	3.141047E 02
4.800000E 02	\$ \$ \$	3.146565E 02
5.100000E 02	S	3,151738E 02
5.400000E 02	Š	3.156589E 02
5.700000E 02	5	3.161138E 02
	3	
6.000000E 02	5	3.165403E 02
6.300000E 02	5	3.169404E 02
6.600000E 02	5 5	3,173157E 02
6.900000E 02	S	3.176677E 02
7.200000E 02	Š	3.179978E 02
7.500000E 02	Š	3.183076E 02
	. 5	
7.800000E 02	5	
8.100000E 02	S	3,188706E 02
8.400000E 02	S S	3.191262E 02
8.700000E 02	S	3.193660E 02
9.000000E 02	S	3.195908E 02
9.300000E 02	5	3,198018E 02
9.600000E 02	š	
9.900000E 02	S	3.201855E 02
1.020000E 03	S	3.203596E 02
1.050000E 03	S	3.205229E 02
1.080000E 03	S	3.206763E 02
1.110000E 03		3.208201E 02
1.140000E 03	\$ \$	3.209548E 02
	5	
1.1700COE 03	5	
1.200000E 03	S	3.212000E 02
1.230000E 03	5	3.213113E 02
1.2600CGE 03	S	3.214160E 02
1.290000E 03	5 5 5	3.215139E 02
1.32000E 03	č	3.216057E 02
	3	
1.35000E 03	5	3.216919E 02

13

TIME		TYPE	VALUE	
0.0 3.000000E	01	s s	3.000000E 3.009070E	02 02
3000000.	01	S	3.025188E	02
9.000000E 1.200000E	01 02	S S	3.040464E 3.054761E	02 02
1.50000E	02	S	3.068083E	02
1.800000E 2.100000E	02 02	s s	3.080496E 3.092061E	02 02
2.400000E	02	S	3.102847E	02
2.700000E 3.000000E	02 02	5 S	3.112913E 3.122317E	02 02
3.300000E 3.600000E	02 02	s s	3.131108E 3.139333E	02 02
3.90000E	02	5 S	3.139333E 3.147029E	02
4.200000E 4.500000E	ე2 02	S S	3.154236E 3.160986E	02 02
4.800000E	02	S	3.167310E	02
5.100000E 5.400000E	02 02	S S	3.173235E 3.178789E	02 02
5.700000E	02	S	3.183997E	02
6.000000E 6.300000E	02 02	s s	3.188877E 3.193455E	02 02
6.60000E	02	S	3.197749E	02
6.900000E 7.200000E	02 02	S S	3.201775E 3.205552E	02 02
7.500000E 7.800000E	02 02	s s	3.209092E 3.212417E	02 02
8.100000E	02	S S	3.212417E	02
8.4000COE 8.7000CCE	02 02	s s	3.218450E 3.221191E	02 02
9.000000E	02	S	3.223762E	02
9.3000COE 9.6000COE	02 02	s s	3.226174E 3.228438E	02 02
9.9C0000E	02	S	3.220559E	02
1.020000E 1.050000E	03 03	s s	3.232551E 3.234419E	02
1.0800002	03	S	3.236169E	02
1.110000E 1.140000E	03 03	s s	3.237813E 3.239355E	02 02
1.170000E 1.208000E	03	s s	3.240801E 3.242158E	02
1.230000E	03		3.243430E	02 02
1.260000E 1.290000E	03 03	s s s	3.244624E 3.245742E	02 02
1.320000E	03	\$	3.2467943	02
1.350000E	03	S	3.247781E	02

c = GI-TNICq

TIME	TYPE	VALUE
0.0	S	3.000000E 02
3.000000E 01	S	3.002195E 02
6.000000E 01	S	3.005918E 02
9.000000E 01	s	3.009272E 02
1.200000E 02	š	3.012407E 02
1.500000E 02	S	3.015371E 02
1.800000E 02	S	3.018184E 02
2.100000E 02	S	3.020854E 02
2.403000E 02	S	3.023384E 02
2.700000E 02	Š	3.025776E 02
	3	
3.000000E 02	S	3.02E035E 02
3.300000E 02	S	3.030168E 02
3.6000COE 02	S	3.032178E 02
3.900000E 02	s	3.034072E 02
4,20000GE 02	š	3.C35654E 02
	3	
4.500000E 02	S S	3.037529E 02
4.600000E 02	5	3.039104E 02
-5.100000E 02	s s	3.040583E 02
5.400000E 02	S	3.041975E 02
5.70000CE 02	Š	3.043281E 02
6.000000E 02	Š	
	3	3.044507E C2
6.300000E 02	ş	3.045659E 02
6.600000E 02	S	3.046741E 02
6.900000E 02	S	3.047756E 02
7.200000E 02	S	3.048708E 02
7.500000E 02	Š	3.049602E 02
7.800000E 02	S	
		3.050442E 02
8.100000E 02	S	3.051228E 02
8.400000E 02	S	3.051958E 02
8.700000E 02	S	3.052661E 02
9.000000E 02	s	3.053311E 02
9.300000E 02	Š	3.053921E 02
9.600000E 02	S	3.054492E 02
9.900000E 02	s s	3.055029E 02
1.020000E 03	\$	3.055532E 02
1.05000CE 03	S	3.056006E 02
1.080000E 03	S	3.056448E 02
1.110000E 03	Š	3.056865E 02
	3	
1.140000E 03	S	3.057256E 02
1.170000E 03	S	3.057622E 02
1.200000E 03	S	3.057966E 02
1.230000E 03	s	3.058289E 02
1.260000E 03	Š	3.058591E 02
1.290000E 03	S	
1.320000E 03	S	3.059141E 02
1.350000E 03	S.	3.059390E 02

TIME	TYPE	VALUE
0.0		3.000000E 02
3.000000E 01	S S	3.003653E 02
6.0000COE 01	S	3.0'08508 02
9.000000E 01		3.017725E 02
1.2000CCE 02	? S	3.024348E 02
1.5000000 02	? S	3.000674E 02
1.800000E 02		3.006582E 02
2.100000E 03	? S	3.042375E 02
2.400000E 02		3.0477568 02
2.700000E 02	s s	3.052837E 02
3.000000E 02		3.057625E 02
3.3C0000E 02	2 5	3.062136E 02
3.600000E 02	? S	3.0663825 02
3.9000C0E 02	? S	3.070376E 02
4.2000CCE 02	2 5	3.074131E 02
4.5000008 02		3.077659E 02
4.800000E 02	2 5	3.0209745 02
5.100000E 0	: 5	3.084087E 02
5.40000CE 02	2 5	3.087012E C2
5.700000E 02 6.000000E 02	2 5	3.089756E 02 3.032332E 02
6.3000COE 02	2 5	
6.600000E 0	2 3	3.094751E 02 3.097021E 02
6.900000E 0	2 S	3.097021E 02 3.099153E 02
7.200000E 0		3.101152E U2
7.5000000 0	2 \$	3.101132E 02 3.103030E 02
7.800000E 0		3.104790E 02
8.100000E 0		3.106443E 02
8.400000E 0	2 5	3.167993E 02
8.700000E 0		3.109448E 02
9.00000CE 0	2 5	3.110811E 02
9.300000E 0	2 5	3.112090E 02
9.6000005 0	2 S	3.113291E 02
9.9C0000E 0	2 S	3.114419E 02
1.02000CE 0	3 S	3.1154768 02
1.050000E 0	3 S	3.1:6467E 02
1.080000E 0	3 S	3.117397E 02
1.1100COE 0	3 S	3.118269E 02
1.140000E 0	3 S	3.119087E 02
1.17J000E 0	3 S	3.119856E 02
1.200000E 0		3.120576E 02
1.2300COE 0	3 S	3.121252E 02
1.260000E 0	3 S	3.121885E 02
1.290000E 0	3 S	3.122480E 02
1.3200C0E 0	3 S	3.123040E 02
1.350000E 0	3 S	3.123564E 02

TIME		TYPE	VALUE
0.0		s	3.000000E 02
3.000000E	01	Š	3.008613E 02
6.00000GE	01	Š	3.023389E 02
9.000000E	01	Š	3.036787E 02
1.200000E	02	S	3.049131E 02
1.500000E	02	S	3.060588E 02
1.8000CCE	02	S	3.071262E 02
2.100000E	02	S	3.021226E 02
2.4000G0E	02	s s	3.09U537E 02
2.70000CE	02	S	3.093248E 02
3.000000E	02	s	3.107400E 02
3.300000E	02	S	3.115034E 02
3.600000E	02	s	3.122185E 02
3.900000E	02	S	3.128884E 02
4.200000E	02	S	3,1351645 02
4.500000E	02	S	3.141047E 02
4.800000E	02	S	3.146565E 02
5.100000E	02	S	3.151738E 02
5.400000E	02	S S	3.155589E 02
5.700000E	02	S	3.161138E 02
6.000000E	02	S	3.165403E 02
6.300000E	02	S	3.169404E 02
6.600000E	02	S	3.173157E 02
6.90000GE	02	S	3.176677E 02
7.200000E	02	S	3.179980E 02
7.500000E	02	S	3.183076E 02
7.800000E	02	S	3.185981E 02
8.100000E	02	S	3.188706E 02
8.400000E	02	S	3.191262E 02
8.700000E	02	S	3.193660E 02
9.000000E	02	S	3.195908E 02
9.300000E	02	S	3.198018E 02
9.6000C0E	02	S	3.199998E 02
9.90000E	02	S	3.201855E 02
1.020000E	03	S	3.203596E 02
1.050000E	03	S	3.205229E 02
1.080000E	03	S S S	3.206763E 02
1.110000E	03	S	3.208201E 02
1.140000E	03	S	3.209551E 02
1.170000E	03	S	3.210815E 02
1.2000005	03	Š	3.212C02E 02
1.230000E	03	S	3.213115E 02
1.260000E	03	S	3.214160E 02
1.29000CE	C3	S S	3.215139E 02
1.320000E	03	S	3.216060E 02
1.350000E	03	S	3.216921E 02

8 = DI-TAIC9

TIME	TYPE	VALUE	
0.0	S	3.000000E 02	,
3.000000E 01	S	3.009072E 02	
6.000000E 01	S	3.025188E 02	
9.0000COE 01	S	3.040464E 02	
1.20000CE 02	S	3.054761E 02	
1.500000E 02	s ·	3.068086E 02	
1.80J000E 02	S	3.080498E 02	
2.100000E 02	S	3.092061E 02	
2.400000E 02	S	3.102847E 02	
2.7000C0E 02	S	3.112913E 02	
3.000000E 02	S	3.122317E 02	
3.3000COE 02	S	3.131108E 02	
3.600000E 02	S	3.139331E 02	
3.9000CCE 02	S	3.147029E 02	
4.200000E 02	S	3.154236E 02	
4.500000E 02	S	3.160936E 02	
4.800000E 02	Ş	3.167310E 02	
5.100000E 02	S	3.173235E 02	
5.400000E 02	S	3.178789E 02	
5.700000E 02 6.000000E 02	s s	3.183997E 02 3.188879E 02	
6.300000E 02	S		
6.600000E 02	S	3.193455E 02 3.197749E 02	
6.900000E 02	5	3.201775E 02	
7.2000COE 02	S	3.205552E 02	
7.500000E 02	S	3.209094E 02	
7.800000E 02	Š	3.212415E 02	
B.100000E 02	Š	3.215530E 02	
8.400000E 02	š	3.218452E 02	
8.700000E 02	Š	3.221191E 02	
9.000000E 02	S	3.223762E 02	
9.300000E 02	Ş	3.226174E 02	
9.600000E C2	S	3.228438E 02	
9.9000CCE 02	S	3.230562E 02	
1.02000UE 03	S	3.232551E 02	
1.050000E 03	S	3.234419E 02	
1.080000E 03	S	3.236172E 02	
1.11000GE 03	S	3.237815E 02	
1.14C00CE 03	S	3.239355E 02	
1.170000E 03	S	3.240801E 02	
1.200000E 03	S	3.242158E 02	
1.230000E 03	S	3.243430E 02	
1.260000E 03	S	3.244624E 02	
1.2900COE 03	S	3.245745E 02	
1.3200COE 03	S	3.246794E 02	
1.350000E 03	S	3.247781E 02	

TIME	TYPE	VALUE	
0.0	s	3.000000E	02
3.000000E 01	S	2.999993E	02
6.000000E 01	S	3.CC0000E	02
9.000000E 01	S	2+909993E	02
1.200000E 02	S	3.000000E	02
1.50000CE 02	Š	2.990993E	02
1.800000E 02	Š		02
2.10000CE 02	S	2.999995E	02
2.400000E 02	S	2.99998E	02
2.700000E 02	S	2.999995E	02
3.000000E 02	S	2.999998E	02
3.300000E 02	Š	2.999998E	02
3.6000COE 02	Š	2.999998E	02
	S		
3.900000E 02		2.999998E	02
4.200000E 02	S	2.999998E	02
4.500000E 02	S	2.99993E	02
4.800000E 02	S	2.999998E	02
5.100000E 02	S	2.99998E	02
5.400000E 02	S	2.999998E	02
	3		
5.700000E 02	S S	2.999998E	02
6.000000E 02		2.999998E	02
6.30000CE 02	S	2.999998E	02
6.60000CE 02	S	2.939998E	02
6.900000E 02	S	2.999998E	02
7.200000E 02	S	2.999998E	02
7.500000E 02	Š	2.999998E	02
	S		
	3	2.999998E	02
8.100000E 02	s	2.997998E	02
8.400000E 02	S S	2.999998E	02
8.700000E 02	3	2.999998E	02
9.000000E 02	S	2.999998E	02
9.300000E 02	S	2.999998E	02
9.600000E 02	Š	2.99998E	02
9.900000E 02	Š	2.999998E	02
	5		
1.020000E 03	. S	2.999998E	02
1.0500C0E 03	S	2.999398E	02
1.080000E 03	S	2.999998E	02
1.110000E 03	s	2.99998E	02
1.140000E 03	s s	2.999998E	02
1.170000E 03	š	2.999998E	02
	3		
	S	3.000005E	02
1.230000E 03	S	2.999998E	02
1.260000E 03	S	3.000005E	02
1.290000E 03	S	2.999998E	02
1.320000E 03	S	3.000005E	02
1.350000E .03	Š	2.999998E	02
	~	a	

```
NASTRAN LOADED AT LOCATION OFAF20
TIME TO GO = 59 CPU SEC., 298 I/O SEC.
                                            SEM1
                                                  BEGN
     O CPU-SEC.
                        C ELAPSED-SEC.
                                            SEMT
     O CPU-SEC.
                        O ELAPSED-SEC.
     O CPU-SEC.
                        3 ELAPSED-SEC.
                                            NAST
                                            GNFI
     O CPU-SEC.
                        3 ELAPSED-SEC.
     O CPU-SEC.
                        3 ELAPSED-SEC.
                                            XCSA
     O CPU-SEC.
                        4 ELAPSED-SEC.
                                            IFP1
                                            XSOR
     1 CPU-SEC.
                        7 ELAPSED-SEC.
                                                  IFP
     1 CPU-SEC.
                       12 ELAPSED-SEC.
                                              DO
     2 CPU-SEC.
                       24 ELAPSED-SEC.
                                             END
                                                   IFP
     2 CPU-SEC.
                       24 ELAPSED-SEC.
                                            XGPI
                                            SEM1 END
     4 CPU-SEC.
                       30 ELAPSED-SEC.
                                                  LINKNSO2 ---
                                             ----
     4 CPU-SEC.
                       31 ELAPSED-SEC.
    22 I/O SEC.
LAST LINK DID NOT USE 40016 BYTES OF OPEN CORE
                                                   LINK END ---
     4 CPU-SEC.
                       33 ELAPSED-SEC.
                                             ----
     4 CPU-SEC.
                        GS ELAPSED-SEC.
                                             XSFA
     4 CPU-SEC.
                        34 ELAPSED-SEC.
                                             XSFA
     4 CPU-SEC.
                        54 ELAPSED-SEC.
                                             3
                                                   GP1
                                                           BEGN
     4 CPU-SEC.
                        1.9 ELAPSED-SEC.
                                             3
                                                   GP1
                                                           END
                                             8
                                                   GP2
                                                           BEGN
     4 CPU-SEC.
                       41 ELAPSED-SEC.
                                                   GP2
                                                           END
     4 CPU-SEC.
                        41 ELAPSED-SEC.
                                             8
                                                   PLTSET
                                                           BEGN
     4 CPU-SEC.
                        42 ELAPSED-SEC.
                                             10
                                                   PLTSET
      4 CPU-SEC.
                        42 ELAPSED-SEC.
                                             10
                                                           END
      4 CPU-SEC.
                       43 ELAPSED-SEC.
                                             12
                                                   PRTMSG
                                                           BEGN
      4 CPU-SEC.
                        43 ELAPSED-SEC.
                                             12
                                                   PRTMSG
                                                           END
                                                   SETVAL
      4 CPU-SEC.
                        44 ELAPSED-SEC.
                                             13
                                                           BEGN
                                                   SETVAL
      4 CPU-SEC.
                        44 ELAPSED-SEC.
                                             13
                                                           END
      4 CPU-SEC.
                        45 ELAPSED-SEC.
                                             21
                                                   GP3
                                                            BEGN
                        51 ELAPSED-SEC.
                                                   GP3
                                                            END
      4 CPU-SEC.
                                             21
                                                            BEGN
      4 CPU-SEC.
                        52 ELAPSED-SEC.
                                             23
                                                   TA1
                                                   TA1
                                                           END
      5 CPU-SEC.
                        63 ELAPSED-SEC.
                                             23
      5 CPU-SEC.
                        64 ELAPSED-SEC.
                                                   LINKNSO3 ---
     53 1/0 SEC.
 LAST LINK DID NOT USE 82788 BYTES OF OPEN CORE
      5 CPU-SEC.
                        68 ELAPSED-SEC.
                                                  LINK END ---
                                             27
                                                   SMA1
                                                            BEGN
      5 CPU-SEC.
                        68 ELAPSED-SEC
                                                            END
      5 CPU-SEC.
                        71 ELAPSED-SEC.
                                             27
                                                   SMA1
      5 CPU-SEC.
                        "2 ELAPSED-SEC.
                                             30
                                                   SMA2
                                                            BEGN
      5 CPU-SEC.
                        "4 ELAPSED-SEC.
                                             30
                                                   SMA2
                                                            END
      5 CPU-SEC.
                        "5 ELAPSED-SEC.
                                             ----
                                                   LINKNSO5 ---
     61 I/O SEC.
 LAST LINK DID NOT USE 64268 BYTES OF OPEN CORE
      5 CPU-SEC.
                        79 ELAPSED-SEC.
                                             ---- LINK END ---
      5 CPU-SEC.
                        79 ELAPSED-SEC.
                                             35
                                                   RMG
                                                            BEGN
      5 CPU-SEC.
                        82 ELAPSED-SEC.
                                             SDCO MP
                                                  MP
      5 CPU-SEC.
                        83 ELAPSED-SEC.
                                             SDCO
      5 CPU-SEC.
                        84 ELAPSED SEC.
                                             FBS
      5 CPU-SEC.
                        86 ELAPSED-SEC.
                                             FBS
      5 CPU-SEC.
                        86 ELAPSED-SEC.
                                             MPYA D
                                                   METHOD 2 NT.NBR PASSES = 1,EST. TIME a
      5 CPU-SEC.
                        88 ELAPSED-SEC.
                                             MPYA
                                                   Ð
      6 CPU-SEC.
                        88 ELAPSED-SEC.
                                             TRAN POSE
      6 CPU-SEC.
                        90 ELAPSED-SEC.
                                             TRAN POSE
      6 CPU-SEC.
                        90 ELAPSED-SEC.
                                             MPYA
                                                   D
```

```
0.0
                                                METHOD 2 NT.NBR PASSES = 1.EST. TIME *
    S CPU-SEC.
                      91 ELAPSED-SEC.
                                          MPYA D
    a CPU-SEC.
                      93 ELAPSED-SEC.
                                          35
                                                RMG
                                                         END
                      95 ELAPSED-SEC.
                                          ---- LINKNSO4 ---
     5 CPU-SEC.
   77 I/O SEC.
LAST LINK DID NOT USE 72520 BYTES OF OPEN CORE
     6 CPU-SEC.
                     1CO ELAPSED-SEC.
                                          --- LINK END ---
     5 CPU-SEC.
                     100 ELAPSED-SEC.
                                          40
                                                GP4
                                                         BEGN
    S CPU-SEC.
                     1(3 ELAPSED-SEC.
                                          40
                                                GP4
                                                         END
    6 CPU-SEC.
                     1(5 ELAPSED-SEC.
                                          46
                                                GPSP
                                                         BEGN
                                          46
                                                GPSP
                                                         END
     6 CPU-SEC.
                     105 ELAPSED-SEC.
    6 CPU-SEC.
                     105 ELAPSED-SEC.
                                          ---- LINKNS14 ---
    85 I/O SEC.
LAST LINK DID NOT USE 117044 BYTES OF OPEN CORE
                                          ---- LINK END ---
     6 CPU-SEC.
                    110 ELAPSED-SEC.
                                          47
                                                OFP
                                                         BEGN
     6 CPU-SEC.
                     110 ELAPSED-SEC.
                                          47
                                                OFP
                                                         END
     6 CPU-SEC.
                     111 ELAPSED-SEC.
                                           ---- LINKNS04 ---
     6 CPU-SEC.
                     113 ELAPSED-SEC.
    89 I/O SEC.
LAST LINK DID NOT USE 115664 BYTES OF OPEN CORE
     6 CPU-SEC.
                     116 ELAPSED-SEC.
                                          ---- LINK END ---
                     116 ELAPSED-SEC.
                                          51
                                                MCE1
                                                         BEGN
     6 CPU-SEC.
                                                         FND
     6 CPU-SEC.
                     119 ELAPSED-SEC.
                                          51
                                                MCE 1
     6 CPU-SEC.
                                          53
                                                MCE2
                                                         BEGN
                     119 ELAPSED-SEC.
                                          MPYA D
     6 CPU-SEC.
                     122 ELAPSED-SEC.
                                                                                               0.0
                                                METHOD 2 NT.NBR .PASSES = 1.EST. TIME =
     7 CPU-SEC.
                     124 ELAPSED-SEC.
                                           MPYA D
     7 CPU-SEC.
                     124 ELAPSED-SEC.
                                           MPYA D
                                                                                                0.0
                                                 METHOD 2 T .NBR PASSES =
                                                                           1.EST. TIME =
                                          MPYA D
     7 CPU-SEC.
                     11.5 ELAPSED-SEC.
     7 CPU-SEC.
                     126 ELAPSED-SEC.
                                           MPYA
                                                 METHOD 2 T .NBR PASSES =
                                                                           1.EST. TIME =
                                                                                                0.0
     7 CPU-SEC.
                     128 FLAPSED-SEC.
                                           MPYA D
                                           MPYA D
     8 CPU-SEC.
                     131 ELAPSED-SEC.
                                                 METHOD 2 NT.NBR PASSES =
                                                                            1.EST. TIME =
                                                                                                0.0
     8 CPU-SEC.
                     132 ELAPSED-SEC.
                                           MPYA D
     8 CPU-SEC.
                     133 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 T .NBR PASSES =
                                                                            1.EST. TIME =
                                                                                                0.0
                                           MPYA D
     8 CPU-SEC.
                     134 ELAPSED-SEC.
                                           MPYA
                                                D
     8 CPU-SEC.
                     134 ELAPSED-SEC.
                                                 METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                                0.0
     8 CPU-SEC.
                     136 ELAPSED-SEC.
                                           MPYA
     9 CPU-SEC.
                     139 ELAPSED-SEC.
                                           MPYA
                                                 METHOD 2 NT.NBR PASSES =
                                                                           1.EST. TIME =
                                                                                                0.0
                                           MPYA D
     9 CPU-SEC.
                     141 ELAPSED-SEC.
     9 CPU-SEC.
                     141 ELAPSED-SEC.
                                           MPYA
                                                                                                0.0
                                                 METHOD 2 T .NBR PASSES A
                                                                            1.EST. TIME =
                                           MPYA D
     9 CPU-SEC.
                     1-3 ELAPSED-SEC.
     9 CPU-SEC.
                                           MPYA D
                     143 ELAPSED-SEC.
                                                                                                0.0
                                                 METHOD 2 T .NBR PASSES = 1.EST. TIME =
     9 CPU-SEC.
                                           MPYA D
                     145 ELAPSED-SEC.
     9 CPU-SEC.
                     146 ELAPSED-SEC.
                                                         END
                                           53
                                                 MCE2
    10 CPU-SEC.
                     149 ELAPSED-SEC.
                                           XSFA
    10 CPU-SEC.
                     150 ELAPSED-SEC.
                                           XSFA
                     150 ELAPSED-SEC.
                                                LINKNSO6 ---
    10 CPU-SEC.
   111 I/O SEC.
LAST LINK DID NOT USE 102132 BYTES OF OPEN CORE
                                           ---- LINK END ---
    10 CPU-SEC.
                     152 ELAPSED-SEC.
                                                         BEGN
                                           75
                                                 DPD
    10 CPU-SEC.
                     152 ELAPSED-SEC.
                     157 ELAPSED-SEC.
                                           75
                                                 DPD
                                                         END
    10 CPU-SEC.
                                           ---- LINKNS10 ---
                     160 ELAPSED-SEC.
    10 CPU-SEC.
   120 I/O SEC.
LAST LINK DID NOT USE 116416 BYTES OF OPEN CORE
```

---- LINK END ---

10 CPU-SEC.

163 ELAPSED-SEC.

```
10 CPU-SEC. ·
                     163 ELAPSED-SEC.
                                                 MTRXIN BEGN
                                          81
    10 CPU-SEC.
                     164 ELAPSED-SEC.
                                                 MTRXIN
                                                         END
    10 CPU-SEC.
                     165 ELAPSED-SEC.
                                           83
                                                 PARAM
                                                         BEGN
    10 CPU-SEC.
                     165 ELAPSED-SEC.
                                           83
                                                 PARAM
                                                         END
    10 CPU-SEC.
                     168 ELAPSED-SEC.
                                           XSFA
    10 CPU-SEC.
                                           XSFA
                     169 ELAPSED-SEC.
                                                 GKAD
                                                         BEGN
    10 CPU-SEC.
                     169 ELAPSED-SEC.
                                           88
    10 CPU-SEC.
                     172 ELAPSED-SEC.
                                           88
                                                 GKAD
                                                         END
    10 CPU-SEC.
                     172 ELAPSED-SEC.
                                                 LINKNSO5 ---
   127 I/O SEC.
LAST LINK DID NOT USE 117064 BYTES OF OPEN CORE
    10 CPU-SEC.
                     175 ELAPSED-SEC.
                                           ---- LINK END ---
    10 CPU-SEC.
                     175 ELAPSED-SEC.
                                           92 TRLG
                                                         BEGN
    11 CPU-SEC.
                     184 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 T .NBR PASS-3 = 1.EST. TIME =
                                                                                                0.0
    11 CPU-SEC.
                     186 ELAPSED-SEC.
                                           MPYA
                                                 D
    11 CPU-SEC.
                     188 ELAPSED-SEC.
                                           MPYA
                                                 METHOD 2 NT.NBR PASSES = 1.EST. TIME =
    11 CPU-SEC.
                     189 ELAPSED-SEC.
                                           MPYA D
    11 CPU-SEC.
                     189 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 NT.NBR PASSES =
                                                                           1.EST. TIME =
                                                                                                0.0
    11 CPU-SEC.
                     191 ELAPSED-SEC.
                                           MPYA D
    11 CPU-SEC.
                     191 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                0.0
    12 CPU-SEC.
                     193 ELAPSED-SEC.
                                           MPYA D
    12 CPU-SEC.
                     193 ELAPSED-SEC.
                                           92
                                                 TRLG
                                                         END
    12 CPU-SEC.
                     194 ELAPSED-SEC.
                                           ---- LINKNS11 ---
   142 I/O SEC.
LAST LINK DID NOT USE 58172 BYTES OF OPEN CORE
    12 CPU-SEC.
                     199 ELAPSED-SEC.
                                           ---- LINK END ---
    12 CPU-SEC.
                     A99 ELAPSED-SEC.
                                           97
                                                 TRHT
                                           DECO MP
    12 CPU-SEC.
                     202 ELAPSED-SEC.
    12 CPU-SEC.
                     203 ELAPSED-SEC.
                                           DECO MP
    13 CPU-SEC.
                                                         END
                     254 ELAFSED-SEC.
                                           97
                                                 TRHT
    13 CPU-SEC.
                     255 ELAPSED-SEC.
                                           ---- LINKNS12 ---
   202 1/0 SEC.
LAST LINK DID NOT USE 69268 BYTES OF OPEN CORE
    14 CPU-SEC.
                     264 ELAPSED-SEC.
                                           ---- LINK END ---
    14 CPU-SEC.
                     264 ELAPSED-SEC.
                                                 VDR
                                                         BEGN
    14 CPU-SEC.
                     268 ELAPSED-SEC.
                                                 VDR
                                                          END
    14 CPU-SEC.
                      269 ELAPSED-SEC.
                                                 PARAM
                                                         BEGN
                                           111
    14 CPU-SEC.
                     269 ELAPSED-SEC.
                                           111
                                                 PARAM
                                                         END
    14 CPU-SEC.
                     270 ELAPSED-SEC.
                                           XSFA
    14 CPU-SEC.
                      271 ELAPSED-SEC.
                                           XSFA
    14 CPU-SEC.
                      271 ELAPSED-SEC.
                                           115
                                                 SDR1
                                                         BEGN
    14 CPU-SEC.
                      271 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                0.1
                                           MPYA D
    14 CPU-SEC.
                      273 ELAPSED-SEC.
    14 CPU-SEC.
                      277 ELAPSED-SEC.
                                           115 SDR1
                                                         END
    14 CPU-SEC.
                      2"7 ELAPSED-SEC.
                                           ---- LINKNSOB ---
   212 I/O SEC.
LAST LINK DID NOT USE 119096 BYTES OF OPEN CORE
    15 CPU-SEC.
                      282 ELAPSED-SEC.
                                           ---- LINK END ---
    15 CPU-SEC.
                      282 ELAPSED-SEC.
                                           118
                                                PLTTRAN BEGN
    15 CPU-SEC
                      280 ELAPSED-SEC.
                                           118
                                                 PLTTRAN END
    15 CPU-SEC.
                      283 ELAPSED-SEC.
                                           ---- LINKN513 ---
   216 I/O SEC.
LAST LINK DID NOT USE 114512 BYTES OF OPEN CORE
    15 CPU-SEC.
                      287 ELAPSED-SEC.
                                           ---- LINK END ---
    15 CPU-LEC.
                      287 ELAPSED-SEC.
                                           120
                                                 SDR2
                                                          BEGN
    15 CPU-SEC.
                      293 ELAPSED-SEC.
                                           120
                                                 SDR2
                                                          END
    15 CPU-SEC.
                      293 ELAPSED-SEC.
                                           ---- LINKNS14 ---
   222 I/O SEC.
```

LAST LINK DID NOT USE 66428 BYTES OF OPEN CORE

```
15 CPU-SEC.
                      300 ELAPSED-SEC.
                                           ---- LINK END ---
                                         121 SDR3 BEGN
121 SDR3 END
    15 CPU-SEC.
                      300 ELAPSED-SEC.
    15 CPU-SEC.
                      304 ELAPSED-SEC.
                                         123 OFP
    15 CPU-SEC.
                      3C5 ELAFSED-SEC.
                                                          BEGN
    16 CPU-SEC.
                      3C8 ELAPSED-SEC.
                                         123 CFP
                                                        END
    16 CPU-SEC.
                      308 ELAPSED-SEC.
                                         130 XYTRAN BEGN
                                         130 XYTRAN END
    16 CPU-SEC.
                      308 ELAPSED-SEC.
                                         ---- LINKNSQ2 ---
   16 CPU-SEC.
                      309 ELAPSED-SEC.
= 232 I/O SEC.
 LAST LINK DID NOT USE 11408 BYTES OF OPEN CORE
                                         ---- LINK END ---

    16 CPU-SEC.

                   318 ELAPSED-SEC.
                  318 ELAPSED-SEC. 132 XYPLOT BEGN
318 ELAPSED-SEC. 132 XYPLOT END
318 ELAPSED-SEC. 138 EXIT BEGN
    16 CPU-SEC.
    16 CPU-SEC.
   16 CPU-SEC.
= 234 I/O SEC.
LAST LINK DID NOT USE 97232 BYTES OF OPEN CORE
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AMOUNT OF OPEN CORE NOT USED = 11K BYTES

MINIMARKAN MAKASIMANANAN MARAMANAN M

MC IA FASINIA ADEREMANS MIMARAMA - MROMMORMAMMAREMANIMAMAMANINI

MARTINE DE L'ALLE DE

Маке применя на просмето в составание и предоставание выправления в применяющим применающим применяющим применающим применам применам применам применам применам применам применам примена MERCHANDENING MM

Modula Distriction of the Communication of the Comm FAMEASIMANGERANDIAM A VICAMERA ULBESSARIUMBARANDA MIRAMMERARANDAMMANAMANGAMARANDAMMAN//////

MMMS-1MSGSCSIGMENTAL IN SCIENTES DESCRIPTION DE MARMAMME MAINDAMHAIR MARMAMMARAMATAMACA (1/1// MANAGEMENT TO THE PROPERTY OF

MASYAT NEGGEROLAGAMERANIA - HAGEGAS ARAGEMANNAS TAMOREGAMAMAM - MANAMANAMAM//////--MMMMMMMM

MMMMMMM -- MICHAEL BERNARD -- MARINE BERNARD --

MONTH TO PARTY. MARMATURA MARKANIA MMMMMMMMM /MM --MM MMMMMM MMMMM MMMM MMMM AMMINIMATION. MATCANIANGE LIMMORDMM MMMMMM/// /// M MM--MMM MMM MMM MMM MMMM MMMM MM MANAGEMENTALISMS MINIMANIM MANAGEMM M 11/1/1// MMMMM - - MMMMM MMMMMMMM MMM MM MMM MMMMM MM MUMBING MINIMA MA M MWMM// /// /////MMM MMMM - - MMMM MMRAGAMMM MMM MMM MM MMMM MM AMBITAN SAMEAN M.50 ALA. 1111 111 MMMMMMMM --- M MWMWN.MM MERCAGO MM M MMM MM MMMM MMMM MM MM MANUACANAMA MARKET / /// ///MM MMMWWMMM - - - M MMMMMM MMMMMMM MMMMMM MMMM MM MMMMMM MANAGEMENTA // M MMMMM - - - MMMMM ///// MMMMM MMMMMM M MMM MMMMMMMMMM MM MMMMM 'MM//////MX' MMMMMM MMMMMM MMM MMM - - - - MMMM M MMMM MINIMIMIM MMM MM MMMM MM MMMM

////MMMMMCA PARAMETERS MAL MIMMINM - - - - Mi MM MUM MIMIM AM

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MMMMMIAAAMW MMATATAM - - FARING MARKIARA KAMAARAARAA MARKAMMAAMMA MAKAMAA MAKAMAAMMA

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SYSTEM GENERATION DATE - 12/31/74

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IBM 360-370 SERIES

RIGID FORMAT SERIES M

LEVEL 15.5.3

MMMM

MODELS 91,95

MMMMMM

```
$
 ID CLASS PROBLEM SIXTEEN, C.E. JACKSON
 $ MAXIMUM CPU TIME ALLOWED FOR THE JOB
TIME 10
 $ THE THERMAL ANALYZER PORTION OF NASTRAN IS TO BE USED
 APP HEAT
 $ THE NON-LINEAR STEADY-STATE SOLUTION ALGORITHM IS TO BE USED
 SOL 3
. $
 $ REQUEST FOR DIAGNOSTIC WHICH PRINTS OUT CONVERGENCE CRITERIA
 $ PRODUCES OUTPUT ONLY FOR SOL 3
 DIAG 18
 GEND
```

PAGE

CASE CONTROL DECK ECHO

```
CARD
COUNT
1
      $
2
      $ END OF EXECUTIVE CONTROL --- START CASE CONTROL ***********************
3
4
      5
      $
6
                NON-LINEAR STEADY-STATE PROBLEM ... CONVECTIVE MULTILAYER INSULATION
      TITLE=
7
      S
8
      S SPECIFY 51 LINES OF DATA PER PAGE (DOES NOT INCLUDE HEADINGS AT TOP OF PAGE)
9
      $
10
      LINE=51
11
      $
12
      $ REQUEST SORTED AND UNSORTED OUTPUT
13
      $ IF THIS CARD IS OMITTED, ONLY THE SORTED BULK DATA WILL APPEAR
14
15
      ECHO=BOTH
16
      $
17
      S SELECT THE SPC. MPC. AND LOAD SETS TO BE USED IN THIS SOLUTION
18
19
      SPC=100
20
      MPC=200
21
      LCAD=300
22
23
      S SELECT THE TEMPERATURE SET WHICH IS AN ESTIMATE OF THE FINAL SOLUTION VECTOR
24
25
      TEMP(MATERIAL)=400
26
      $
27
      $ SELECT THE OUTPUT DESIRED (TEMPERATURES, LOADS, AND CONSTRAINT POWERS)
28
      $
29
      OUTPUT
30
      THERMAL=ALL
31
      OLOAD=ALL
32
      SPCF=ALL
33
34
      35
36
37
      $
38
      BEGIN BULK
```

INPUT' BULK DATA DECK ECHO

```
1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10
$ UNITS MUST BE CONSISTENT
$ IN THIS PROBLEM, METERS, WATTS, AND DEGREES CELSIUS ARE USED
$ DEFINE GRID POINTS
$
                        0.
                                Ο.
                                        Ο.
GRID
        1
                                Ο.
GRID
        2
                        . 1
                                        Ο.
GRID
                        . 2
                                Ο.
                                        0.
                                        ٥.
GRID
                        . з
GRID
                                . 1
GRID
                                        ٥.
                        . 1
                                . 1
GRID
        7
                        . 2
                                . 1
                                        Ο.
GRID
                        . з
                                        ٥.
        8
                                . 1
GRID
                                . 2
                                        ٥.
GRID
        10
                                - . 1
                                        Ο.
GRID
        100
                                .05
$
$ CONNECT GRID POINTS
CROD
        10
                100
                        10
CROD
        20
                100
                        9
                                6
                                2
                                                5
CQUAD2 30
                200
CQUAD2 40
                                3
                                                6
                200
                        2
CQUAD2 50
                200
                        3
                                4
$
$ DEFINE CROSS-SECTIONAL AREAS AND/OR THICKNESSES
$
PROD
        100
                1000
                         .001
PQUAD2 200
                1000
                         .01
$ DEFINE MATERIAL THERMAL CONDUCTIVITY
$
MAT4 1000
                200.
                                                                         ALUMINUM
$
S DEFINE CONVECTIVE AREA AND CONVECTIVE COEFFICIENT 'H'
CHBDY 60
                300
                         LINE
                                                                         +CONVEC
+CONVEC 100
                100
PHBDY
                3000
                         .314
        300
                200.
MAT4
        3000
$ DEFINE CONSTRAINTS
$
MPC
         200
                                1.
                                                         -1.
MPC
                10
        200
                                1.
                                                         -1.
S DEFINE APPLIED LOADS
$
SLOAD
        300
                         4.
                                 2
                                         8.
```

INPUT BULK DATA DECK ECHO

```
5 .. 6 .. 7 .. 8 .. 9 .. 10 .
                             4
SLOAD 300
              3
                     8.
                                    4.
                             6
SLOAD
       300
              5
                      4.
                                    8.
SLOAD
       300
              7
                      8.
                             8
                                    4.
5
S THE FOLLOWING BULK DATA CARDS WERE ADDED TO CONVERT PROBLEM ONE TO
S PROBLEM TWO. THE ONLY BULK DATA CARD REMOVED FROM THE PREVIOUS SOLUTION WAS
$ THE SPC CARD
S
$ THIS SPC1 CARD REPLACES THE SPC CARD REMOVED FROM ABOVE
S
SPC1 100
            1
                     100
$
$ RADIATION BOUNDARY ELEMENTS
5
CHBDY
       200
              2000
                      AREA4
CHBDY
       300
              2000
                      AREA4
                             2
                                    3
                                            7
                                                   6
CHBDY
       40C
              2000
                      AREA4
                             3
                                    4
                                            8
                                                   7
                                    6
                      AREA4
                             5
                                            2
CHBDY
       500
              2000
                                                   1
                                            3
CHBDY
              2000
                      AREA4
                            6
                                    7
                                                   2
       600
                      AREA4
                           7
                                                   3
CHBDY
      700
              2000
$ EMISSIVITY OF RADIATING ELEMENT
S
PHSDY 2000
                             . 90
$ ESTIMATE OF FINAL STEADY STATE SOLITION VECTOR --- REFERENCED
$ BY TEMP(MATERIAL) IN CASE CONTROL
$
TEMP
                      300.
       400
              100
TEMPD
      400
              300.
$
$ PARAMETERS CONTROLLING RADIATION LOADING AND THE ITERATION LOOPING
3
PARAM
      TABS
              273.15
PARAM
       SIGMA
              5.685E-8
PARAM
       MAXIT
              8
PARAM EPSHT
              .0001
$ DEFINITION OF THE RADIATION MATRIX
S ALL OF THE RADIATION GOES TO SPACE
                             500
                                    600
                                            700
SADLST 200
              300
                      400
                                                   Ο.
                      0.
                             Ο.
                                    0.
                                            ٥.
PADMIX 1
              Ο.
RADMITX 2
              Ο.
                      ٥.
                             ٥.
                                    0.
                                            ٥.
                             Ο.
                                    ٥.
RADMIX 3
              Ο.
                      Ο.
                             Ο.
RADMTX 4
              ٥.
                      ٥.
RADMIX 5
              Ο.
                      ٥.
RADMIX 6
              О.
S
```

INPUT BULK DATA DECK ECHO

```
1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 .
  $ THE FOLLOWING BULK DATA CARDS WILL CONVERT PROBLEM TWO TO PROBLEM SIXTEFN.
  S PROBLEM SIXTEEN ADDS MULTILAYER INSULATION TO BOTH SIDES OF THE RADIATING FIN.
  $ AND DOES THIS BY SIMULATING AN EFFECTIVE CONVECTIVITY FROM THE FIN TO THE
  $ RADIATING SURFACES WHICH IS DEPENDENT ON THE THICKNESS OF THE MULTILAYER
  $ INSULATION.
  S NOTE THAT THE RADLST BULK DATA CARD HAS BEEN REPLACED.
  $ ALSO NOTE THAT THE THERMAL GUESS VECTOR HAS NOT BEEN CHANGED. THOUGH IT IS
  $ NO LONGER AS ACCURATE AS IT WAS IN PROBLEM TWO.
- $ AS LONG AS THE TEMPERATURE GUESSES ARE GREATER THAN 80 PERCENT OF THE FINAL
  S SOLUTION AT EACH POINT, THEN CONVERGENCE WILL OCCUR.
  $ THE FOLLOWING GRID POINTS AND CHBDY CARDS DEFINE THE NEW RADIATING SURFACES.
  $ NOTE THAT CONVECTION IS SPECIFIED.
  $
  GRID
                                          C.
  GRID
          12
                          . 1
                                  0.
  GRID
          13
                          . 2
                                  Ο.
                                          n.
  GRID
          14
                                  ٥.
                                          Ο.
                           . З
  GRID
                                          0,
          15
                          ٥.
                                   1
  GRID
          16
                           . 1
                                          Ο.
  GRID
          17
                           . 2
                                           ٥.
                                  . 1
  GRID
          18
                           . 3
                                           Ο.
                                  . 1
  GRID
          21
                          ο.
                                  ٥.
                                          ο.
                                  ٥.
  GRID
          22
                                          ο.
                           . 1
  GRID
          23
                           . 2
                                  Ο.
                                           Ο.
  GRID
          24
                           . 3
                                  ٥.
                                           0.
  GRID
          25
                          Ω.
                                  . 1
                                           Ο.
  GRID
                          . 1
          26
                                          Ο.
                                  . 1
  GRID
          27
                           . 2
                                          0. .
                                  . 1
  GRID
          28
                           . 3
                                   . 1
                                           Ο.
  CHBDY 1200
                   2001
                          AREA4
                                  11
                                           12
                                                   16
                                                           15
                                                                           +MULT1
  +MULT1 1
                           6
                  2
  CHBDY 1300
                   2001
                           AREA4
                                  12
                                           13
                                                   17
                                                           16
                                                                           +MULT2
  +MULT2 2
                          7
                   3
                                  6
                          AREA4
  CHBDY 1400
                   2001
                                  13
                                           14
                                                   18
                                                           17
                                                                           +MULT3
  +MULT3 3
                           8
                                  7
  CHBDY 2500
                   2001
                           AREA4
                                  25
                                           26
                                                   22
                                                           21
                                                                           +MULT10
   +MULT10 5
                   6
                           2
                                   1
  CHBDY 2600
                   2001
                           AREA4
                                  26
                                           27
                                                   23
                                                           22
                                                                           +MULT11
  +MULT11 6
                   7
                           3
  CHBDY 2700
                   2001
                           AREA4
                                           28
                                  27
                                                           23
                                                   24
                                                                           +MULT12
   +MULT12 7
                   8
                           4
                                   3
  $ DEFINE THE EMISSIVITY AND CONVECTIVE COEFFICIENT.
  PHBDY
          2001
                   2002
                                   . 9
  MAT4
          2002
                  1.
  $ REPLACE THE OLD RADLST CARD WHICH WAS REMOVED FROM THE ORIGINAL BULK DATA.
```

NON-LINEAR STEADY-STATE PROBLEM ... CONVECTIVE MULTILAYER IN JANUARY 1, 1976 NASTRAN 12/31/74 PAGE 6

INPUT BULK DATA DECK ECHO

TOTAL COUNT= 163

*** USER INFORMATION MESSAGE 207, BULK DATA NOT SORTED.XSORT WILL RE-ORDER DECK.

PAGE

SORTED BULK DATA ECHO CARD COUNT 3 . . 4 6 8 .. 9 .. 10 . 1 -CHBDY 60 300 LINE +CONVEC +CONVEC 100 2-100 3-CHBDY 200 2000 AREA4 6 5 4-CHBDY 300 2000 AREA4 2 3 7 6 5-CHBDY 400 2000 AREA4 3 7 4 8 6-CHBDY 500 2000 AREA4 5 6 2 1 7 -CHBDY 600 2000 AREA4 6 7 3 2 8-CHBDY 700 2000 AREA4 7 4 3 9-CHBDY 1200 2001 AREA4 11 12 16 15 +MULT1 10-+MULT1 1 2 6 11-CHBDY 1300 2001 AREA4 12 13 17 16 +MULT2 12-+MULT2 3 6 13-CHBDY 1400 2001 AREA4 13 14 18 17 +MULT3 14-+MULT3 3 8 15-CHEDY 2500 2001 AREA4 25 26 22 21 +MULT10 16-+MULT10 5 17-CHBDY 2500 2001 AREA4 26 27 23 22 +MULT11 18-+MULT11 6 7 3 2 19-CHBDY 2700 2001 AREA4 27 28 24 23 +MULT12 20-+MULT12 7 8 3 21-CQUAD2 30 200 2 6 5 22-COUAD2 40 200 2 3 7 6 CQUAD2 23 -50 200 3 4 8 7 24-CROD 10 100 10 2 25 -CROD 20 100 9 6 26-GRID 0.0 0.0 0.0 27-GRID 2 . 1 0.0 0.0 28-GRID 3 . 2 0.0 0.0 29-GRID 4 . 3 0.0 0.0 30-GRID 5 0.0 . 1 0.0 31 -GRID 6 . 1 . 1 0.0 32-GRID 7 . 2 . 1 0.0 33-GRID 8 . 3 . 1 0.0 34-GRID 9 0.0 . 2 0.0 35 -GRID 10 0.0 - . 1 0.0 36-GRID 11 0.0 0.0 0.0 37-GRID . 1 12 0.0 0.0 38 -GRID 13 0.0 . 2 0.0 39-GRID 14 . 3 0.0 0.0 40-GRID 15 0.0 . 1 0.0 41 -GRID 16 . 1 0.0 . 1 42-GRID 17 . 2 . 1 0.0 43-GRID 18 . 3 . 1 0.0 44-GRID 21 0.0 0.0 0.0 45 -GRID 22 . 1 0.0 0.0 46-GRID 23 . 2 0.0 0.0 47-GRID 24 . ૩ 0.0 0.0 48-GRID 25 0.0 . 1 0.0 49-GRID 26 . 1 0.0 . 1 50 -GRID 27 . 2 . 1 0.0 51 -GRID 28 . з . 1 0.0

			s	0	R	T E	D	£	3 U	, ,	. ĸ	ļ	D	Α	T	Δ		Ε	C	н	0							
CARD																												
COUNT	1	2	3			4	1		5	5			6				7				8	٠,	9			10		
52-	GRID	100				05		. 05	5		0	. 0																
53-	MAT4	1000	200.																					Α	LUI	MIN	NUN	И
54 -	MAT4	2002	1.																						·			
55-	MAT4	3000	200.																									
56-	MPC	200	9		1			1.			5				1				- 1									
57 <i>-</i>	MPC	200	10		1			1.			1				1				-1									
58•	PARAM	EPSHT	.0001																									
59-	PARAM	TIXAM	8																									
60 <i>-</i>	PARAM	SIGMA	5.6858	- 8																								
61 -	PARAM	TABS	273.15	,																								
62 <i>-</i>	PHBDY	300	3000		. З	14																						
63 <i>-</i>	PHBDY	2000						. 90)																			
64 -	PHBDY	2001	2002					. 9																				
65 -	PQUAD2	200	1000		.0	1																						
66 -	PROD	100	1000		.0	01																						
67-	RADLST	1200	1300		14	00		250	00		2	600			27	00												
68-	RADMTX	1	0.0		٥.	0		0.0)		0	. 0			0.	0			٥.	0								
69-	RADMIX	2	0.0		Ο.	0		0.0)		0	. 0			Ο.	0												
70-	RADMTX	3	0.0		Ο.	0		0.0)		0	. 0																
71 -	RADMIX	4	0.0		0.	0		0.0	1																			
72-	RADMTX	5 .	0.0		О.	0																						
73-	RADMIX	6	0.0																									
74-	SLOAD	300	1		4.			2			8																	
75-	SLOAD	300	3		8.			4			4																	
76 -	SLOAD	300	5		4.			6			8																	
77 -	SLOAD	300	7		8.			8			4																	
78-	SPC1	100	1		10	0																						
79-	TEMP	400	100		30	Ο.																						
80-	TEMPD ENDDATA	400	300.																									

NO ERRORS FOUND - EXECUTE NASTRAN PROGRAM

*** USER INFORMATION MESSAGE FULL INTERNAL SPACE NODE AVAILABLE

6 ELEMENTS HAVE A TOTAL VIEW FACTOR (FA/A) LESS THAN 0.99 *** USER INFORMATION MESSAGE

*** USER INFORMATION MESSAGE 3023, C = 0 R =

*** USER INFORMATION MESSAGE 3027. SYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

- *** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKFF HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 1
- *** SYSTEM WARNING MESSIGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKSF HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2
- *** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKFS
 HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2
- *** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKSS
 HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 1
- *** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HRFN
 HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2
- *** SYSTEM WARNING MESSAGE 2169. THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB PARTITION HRSN
 HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2
- *** USER INFORMATION MESSAGE 3028, B = 12 BBAR = 13.
 - C = 11 CBAR = 8
 - R = 23
- *** USER INFORMATION MESSAGE 3027. UNSYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

DIAG 18 OUTPUT FROM SSGHT

ITERATION	EPSILON-P	LAMBDA-1	EPSILON-T
1	6.660479E-02		
· 2	1.958826E-02 1.194168E-02	2.047697E 00 1.640297E 00	1.811909E-02 1.448234E-02
4	8.270945E-03	1.443648E 00	1.186501E-02
5	6.107680E-00	1.354246E 00	9.136528E-03
6	4.689548E-03	1.302464E 00	6.925561E-03
7	3.696208E-03	1.263666E 00	5.232777E-03
8	2.968196E-03	1.245798E 00	3.942985E-03

*** USER INFORMATION MESSAGE 3086, ENTERING SSGHT EXIT MODE BY REASON NUMBER 2 (MAXIMUM ITERATIONS)

TEMPERATURE VECTOR

POINT ID.	TYPE	ID VALUE	ID+1 VALUE	ID+2 VALUE	ID+3 VALUE	ID+4 VALUE	ID+5 VALUE
1	S	3.050085E 02	3.104246E 02	3.182302E 02	3.208242E 02	3.050085E 02	3.104246E 02
7	S	3.182302E 02	3.208242E 02	3.050085E 02	3.050085E 02	3.701466E 01	3.779317E 01
13.	S	3.861156E 01	3.885472E 01	3.701454E 01	3.779312E 01	3.861209E 01	3.885464E 01
21	S	3.701447E 01	3.779398E 01	3.861153E 01	3.885516E 01	3.701344E 01	3.779346E 01
27	S	3.861099E 01	3.885524E 01				
100	S	3 000000F 02					

NON-LINEAR STEADY-STATE PROBLEM ... CONVECTIVE MULTILAYER IN JANUARY 1. 1976 NASTRAN 12/31/74 PAGE 10

LOAD VECTOR

POINT ID.	TYPE	ID VALUE	ID+1 VALUE	ID+2 VALUE	ID+3 VALUE	ID+4 VALUE	ID+5 VALUE
1	S	4.000000E 00	8.000000E 00	8.000000E 00	4.000000E 00	4.000000E 00	8.000000E 00
7	S	8.000000E 00	4.000000E 00				

FORCES OF SINGLE-POINT CONSTRAINT

POINT ID. TYPE : ID VALUE ID+1 VALUE ID+2 VALUE ID+3 VALUE ID+4 VALUE ID+5 VALUE 1000 S -3.145313E 01

```
NASTRAN LOADED AT LOCATION 218720
TIME TO GO = 59 CPU SEC.. 238 I/O SEC.
     O CPU-SEC.
                    O ELAPSED-SEC.
                                     SEM1
                                          BEGN
                     O ELAPSED-SEC.
                                     SEMT
     O CPU-SEC.
                     4 ELAPSED-SEC.
                                     NAST
     1 CPU-SEC.
     1 CPU-SEC.
                     4 ELAPSED-SEC.
                                     GNFI
     1 CPU-SEC.
                     4 ELAPSED-SEC.
                                     XCSA
                                     IFP1
     1 CPU-SEC.
                     6 ELAPSED-SEC.
     1 CPU-SEC.
                     9 ELAPSED-SEC.
                                     XSOR
                                       DO
                                          IFP
     2 CPU-SEC.
                    14 ELAPSED-SEC.
     2 CPU-SEC.
                    24 ELAPSED-SEC.
                                      END
                                          IFP
     2 CPU-SEC.
                    24 ELAPSED-SEC.
                                     XGPI
                                     SEM1
                                          END
     3 CPU-SEC.
                    28 ELAPSED-SEC.
                                           LINKNSO2 ---
     3 CPU-SEC.
                    29 ELAPSED-SEC.
    21 I/O SEC.
LAST LINK DID NOT USE
                         C BYTES OF OPEN CORE
                    31 ELAPSED-SEC.
                                     ----
                                          LINK END ---
     4 CPU-SEC.
                                     XSFA
                    31 ELAPSED-SEC.
     4 CPU-SEC.
                                     XSFA
     4 CPU-SEC.
                    32 ELAPSED-SEC.
                                                  BEGN
                    32 ELAPSED-SEC.
                                     2
                                           GP1
     4 CPU-SEC.
                    37 ELAPSED-SEC.
                                           GP1
                                                  END
     4 CPU-SEC.
                                           GP2
                                                  BEGN
     4 CPU-SEC.
                    38 ELAPSED-SEC.
                                     5
     4 CPU-SEC.
                    39 ELAPSED-SEC.
                                     5
                                           GP2
                                                  END
                                           PLTSET
                                                  BEGN
     4 CPU-SEC.
                    "10 ELAPSED-SEC.
                                     7
     4 CPU-SEC.
                    40 ELAPSED-SEC.
                                     7
                                           PLTSET
                                                  END
                    41 ELAPSED-SEC.
                                     9
                                           PRTMSG
                                                  BEGN
     4 CPU-SEC.
                                     9
                                           PRTMSG
                                                  END
     4 CPU-SEC.
                    41 ELAPSED-SEC.
                                                  BEGN
     4 CPU-SEC.
                    42 ELAPSED-SEC.
                                     10
                                           SETVAL
                                     10
                                           SETVAL
                                                  END
     4 CPU-SEC.
                    42 ELAPSED-SEC.
                                     18
                                                  BEGN
                                           GP3
     4 CPU-SEC.
                    43 ELAPSED-SEC.
                                           GP3
                                                  END
     4 CPU-SEC.
                    52 ELAPSED-SEC.
                                      18
     4 CPU-SEC.
                    53 ELAPSED-SEC.
                                      20
                                           TA1
                                                  BEGN
                                                  END
                                      20
                                           T A 1
     5 CPU-SEC.
                    61 ELAPSED-SEC.
                                           LINKNSO3 ---
     5 CPU-SEC.
                    62 ELAPSED-SEC.
    E1 I/O SEC.
 LAST LINK DID NOT USE
                    41828 BYTES OF OPEN CORE
     5 CPU-SEC.
                    65 ELAPSED-SEC.
                                     ---- LINK END ---
                    65 ELAPSED-SEC.
                                     24
                                           SMA1
                                                  BEGN
     5 CPU-SEC.
                                      24
                                           SMA1
                                                  END
                    69 ELAPSED-SEC.
     5 CPU-SEC.
                                           LINKNSO5 ---
     5 CPU-SEC.
                    69 ELAPSED-SEC.
    57 I/O SEC.
                    23308 BYTES OF OPEN CORE
 LAST LINK DID NOT USE
                                           LINK END ---
     5 CPU-SEC.
                    "3 ELAPSED-SEC.
     5 CPU-SEC.
                    73 ELAPSED-SEC.
                                      27
                                           RMG
                                                  BEGN
                    76 ELAPSED-SEC.
                                      SDCO
                                          MP
     5 CPU-SEC.
                                      SDCO
                                           MΡ
     5 CPU-SEC.
                    77 ELAPSED-SEC.
     5 CPU-SEC.
                    78 ELAPSED-SEC.
                                      FBS
     5 CPU-SEC.
                    80 ELAPSED-SEC.
                                      FBS
     5 CPU-SEC.
                    82 ELAPSED-SEC.
                                      MPYA
                                           METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                    0.0
                                      MPYA
                                           D
                    83 ELAPSED-SEC.
     5 CPU-SEC.
                                      TRAN POSE
     5 CPU-SEC.
                    83 ELAPSED-SEC.
     5 CPU-SEC.
                    85 ELAPSED-SEC.
                                      TRAN
                                          POSE
                    85 ELAPSED-SEC.
                                      MPYA
     5 CPU-SEC.
                                                                                    0.0
                                           METHOD 2 NT.NBR PASSES =
                                                                  1.EST. TIME *
                                      MPYA D
     6 CPU-SEC.
                    86 ELAPSED-SEC.
```

9 CPU-SEC.

167 ELAPSED-SEC.

63

SSG2

BEGN

```
6 CPU-SEC.
                       88 ELAPSED-SEC.
                                                  RMG
                                            27
                                                           END
     6 CPU-SEC.
                       90 ELAPSED-SEC.
                                                  LINKNSO4 ---
    72 I/O SEC.
                        31560 BYTES OF OPEN CORE
LAST LINK DID NOT USE
     6 CPU-SEC.
                       93 ELAPSED-SEC.
                                                  LINK END ---
     6 CPU-SEC.
                       93 ELAPSED-SEC.
                                            32
                                                  GP4
                                                           BEGN
     6 CPU-SEC.
                       99 ELAPSED-SEC.
                                            32
                                                  GP4
                                                           END
     6 CPU-SEC.
                      101 ELAPSED-SEC.
                                            38
                                                  GPSP
                                                           BEGN
                      :(2 ELAPSED-SEC.
                                                  GPSP
                                                           END
     6 CPU-SEC.
                                            38
     6 CPU-SEC.
                      : (2 ELAPSED-SEC.
                                            ----
                                                  LINKNS14 ---
    84 I/G SEC.
LAST LINK DID NOT USE
                       76084 BYTES OF OPEN CORE
     6 CPU-SEC.
                      105 ELAPSED-SEC.
                                            ---- LINK END ---
     6 CPU-SEC.
                                                  OFP
                                                           BEGN
                      105 ELAPSED-SEC.
                                            39
     6 CPU-SEC.
                      106 ELAPSED-SEC.
                                                  OFP
                                                           END
     6 CPU-SEC.
                      107 ELAPSED-SEC.
                                                  LINKNSO4 ---
    87 1/0 SEC.
LAST LINK DID NOT USE 74704 BYTES OF OPEN CORE
     6 CPU-SEC.
                      110 ELAPSED-SEC.
                                                  LINK END ---
     6 CPU-SEC.
                      110 ELAPSED-SEC.
                                                  MCE1
                                            42
                                                           BEGN
     6 CPU-SEC.
                      114 ELAPSED-SEC.
                                            42
                                                  MCE1
                                                           END
     7 CPU-SEC.
                                            44
                                                  MCE2
                                                           BEGN
                      115 ELAPSED-SEC.
     7 CPU-SEC.
                      117 ELAPSED-SEC.
                                            MPYA
                                                  D
                                                   METHOD 2 NT, NBR PASSES =
                                                                              1,EST. TIME =
                                                                                                   0.0
     7 CPU-SEC.
                      118 ELAPSED-SEC.
                                            MPYA
    . 7 CPU-SEC.
                      119 ELAPSED-SEC.
                                            MPYA
                                                  D
                                                   METHOD 2 T .NBR PASSES =
                                                                                                   0.0
                                                                               1.EST. TIME =
     7 CPU-SEC.
                      120 ELAPSED-SEC.
                                            MPYA
                                                  D
     7 CPU-SEC.
                      120 ELAPSED-SEC.
                                            MPYA
                                                   METHOD 2 T NBR PASSES =
                                                                               1.EST. TIME =
                                                                                                   0.0
     7 CPU-SEC.
                      122 ELAPSED-SEC.
                                            MPYA
                                                  ח
     7 CPU-SEC.
                      124 ELAPSED-SEC.
                                            MPYA
                                                  D
                                                   METHOD 2 NT. NBR PASSES =
                                                                               1.EST. TIME =
                                                                                                   0.0
     8 CPU-SEC.
                      125 ELAPSED-SEC.
                                             MPYA
     8 CPU-SEC.
                      126 ELAPSED-SEC.
                                             MPYA
                                                   METHOD 2 T .NBR PASSES =
                                                                                                   0.0
                                                                               1.EST. TIME =
     8 CPU-SEC.
                      127 ELAPSED-SEC.
                                             MPYA D
     8 CPU-SEC.
                      127 ELAPSED-SEC.
                                             MPYA
                                                   METHOD 2 T ,NBR PASSES = 1.EST. TIME ■
                                                                                                   0.0
                      129 ELAPSED-SEC.
     3 CPU-SEC.
                                            MPYA
                                                   Ð
     8 CPU-SEC.
                      129 ELAPSED-SEC.
                                             44
                                                   MCE2
                                                           END
     8 CPU-SEC.
                      131 ELAPSED-SEC.
                                             ---- LINKNS07 ---
   106 I/O SEC.
LAST LINK DID NOT USE
                       68244 BYTES OF OPEN CORE
     B CPU-SEC.
                      139 ELAPSED-SEC.
                                                   LINK END ---
     8 CPU-SEC.
                      139 ELAPSED-SEC.
                                             50
                                                   VEC
                                                           BEGN
     8 CPU-SEC.
                       140 ELAPSED-SEC.
                                             50
                                                   VEC
                                                           END
     B CPU-SEC.
                       141 ELAPSED-SEC.
                                                   PARTN
                                                           BEGN
                                             51
     8 CPU-SEC.
                       1-4 ELAPSED-SEC.
                                             51
                                                   PARTN
                                                           END
     8 CPU-SEC.
                      144 ELAPSED-SEC.
                                             52
                                                   PARTN
                                                           BEGN
     9 CPU-SEC.
                       146 ELAPSED-SEC.
                                             52
                                                   PARTN
                                                           END
     9 CPU-SEC.
                      146 ELAPSED-SEC.
                                             55
                                                   DECOMP
                                                           BEGN
     9 CPU-SEC.
                       147 ELAPSED-SEC.
                                             DECO
                                                   MP
      9 CPU-SEC.
                      149 ELAPSED-SEC.
                                             DEC0
     9 CPU-SEC.
                       153 ELAPSED-SEC.
                                             55
                                                   DECOMP
                                                          END
     9 CPU-SEC.
                      156 ELAPSED-SEC.
                                             XSFA
     9 CPU-SEC.
                      157 ELAPSED-SEC.
                                             XSFA
      9 CPU-SEC.
                       157 ELAPSED-SEC.
                                                   LINKNSO5 ---
   118 I/O SEC.
LAST LINK DID NOT USE
                       59592 EYTES OF OPEN CORE
                                                   LINK END ---
      9 CPU-SEC.
                       160 ELAPSED-SEC.
      9 CPU-SEC.
                       160 ELAPSED-SEC.
                                             59
                                                   SSG1
                                                            BEGN
      9 CPU-SEC.
                       166 ELAPSED-SEC.
                                             59
                                                   SSG1
                                                            END
```

```
9 CRU-SEC
                    169 FLARSED-SEC.
                                        MPYA D
                                              METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                         0.0
     9 CPU-SEC
                    171 ELAPSED-SEC.
                                        MEYA
     9 CPUI-STC
                    174 F: 445ED-SEC.
                                        MPYA
                                             D
                                              METHOD 2 NI.NBR PASSES = 1.EST. TIME =
                                                                                         0.0
    10 CRISEC
                    175 FLADSED-SEC
                                        MOVA D
    10 CPU-SEC
                    175 ELAPSED-SEC.
                                        63
                                             SSG2
                                                     FND
    10 CPU-SEC.
                    116 FLARSED-SEC
                                              SSGHT BEGN
                                        66
    11 CPU-SEC.
                    213 ELAPSED-SEC.
                                        66
                                              SSGHT END
    11 CPU-SEC.
                    214 FLAPSED-SEC.
                                        ---- LINKNSOR ---
   163 T/O SEC.
 LAST LINK DID NOT USE 243GR SYTES OF OPEN CORE
                                     ---- LINK END ---
    11 CPU-SEC.
                    223 ELAPSED-SEC.
                    223 ELAPSED-SEC. 71 PLTTRAN BEGN
    11 CPU-SEC.
    11 CPU-SEC.
                    215 FLARSED-SEC.
                                      71 PLTTRAN FND
    11 CPU-SEC.
                                      ---- LINKNS13 ---
                    216 ELAPSED-SEC.
   168 I/O SEC.
 LAST LINK DID NOT USE 73552 BYTES OF OPEN CORE
    11 CPU-SEC.
                    232 FLAPSED-SEC.
                                       ---- I TNK END ---
                                        74 SDR2 BEGN
    11 CPU-SEC
                    232 ELAPSED-SEC.
    11 CPU-SEC.
                    236 ELAPSED-SEC.
                                        74
                                             SDR2
                                                     FND
    11 CPU-SEC.
                                       ---- LINKNS14 ---
                    237 ELAPSED-SEC.
   177 I/O SEC.
 LAST LINK DID NOT USE 25468 EYTES OF OPEN CORE
    11 CPU-SEC.
                    245 ELAPSED-SEC.
                                       ---- LINK END ---
    11 CPU-SEC.
                                        75 OFP
                                                     BEGN
                    245 ELAPSED-SEC.
    11 CPU-SEC.
                    248 FLASSED-SEC.
                                      75 OFP
                                                     END
    11 CPU-SEC.
                    249 FLAPSED-SEC.
                                      ---- ITNKNSI3
  185 I/O SEC.
LAST LINK DID NOT USE 68004 BYTES OF OPEN CORE
    12 CPU-SEC.
                    2G1 ELAPSED-SEC. ---- LINK END ---
                                       77
    12 CPU-SEC.
                    261 FLARSED-SEC.
                                             SORHT BEGN
    12 CPU-SEC.
                    261 ELAPSED-SEC.
                                      77
                                             SDRHT ENJ
    12 CPU-SEC.
                    262 ELAFSED-SEC.
                                      ---- LINKNS14 ---
= 193 I/O SEC.
LAST LINK DID NOT USE SSESS SYTES OF OPEN CORE
    12 CPU-SEC.
                    278 FLARSED-SEC.
                                      ---- I INK END ---
    12 CPU-SEC.
                                        78
                                             OFP
                                                     BEGN
                    278 ELAPSED-SEC.
    12 CPU-SEC.
                                        78
                                             OFP
                    278 ELAPSED-SEC.
                                                     END
    12 CPU-SEC.
                    280 ELAPSED-SEC.
                                        92
                                              EXIT
                                                     BEGN
= 195 I/O SEC.
LAST LINK DID NOT USE 74704 BYTES OF OPEN CORE
AMOUNT OF OPEN CORE NOT USED = OK BYTES
```

INDUSTRIAL PROPERTY AND ASSOCIATION OF A STATE OF A STA

MEGASAMIANIANAMANAMANAMANAMALAMAMANAMANAMA

MANAN PERAPAMANAN PANCE NAMAGARI PARENCAN PARALAMAN MANANANAN

MEIR SIRSMORDINGSMISSINGERMANN - DAMASAMVERSMININGSMISSINGERMANNINGSMISSINGER - DAMASAMVERSMISSINGER - DAMASAMVER IBM 360-370 SERIES MARKELIN GIADAT AND ECONOMIC SECURIOR AND ANALYSIS ANALYSIS AND ANALYSIS AND ANALYSIS AND ANALYSIS AND ANALYSIS AND ANALYSIS AND ANALYSIS AND ANALYSIS AND ANALYSIS AND ANALYSIS AND ANALYSIS ANALYSIS AND ANALYSIS ANALY MODELS 91.95 MERGERGRAPHIN ECONOCIA INCREMENTAL RECOGNICA PROPERTIES DE LES CONTROL DE CON MEGRAMARIA MEGANGARIAN MENANGKAN MENANGSING MENGRAPAKAN MEGANGKAN MENGGAN MENGGAN MENGAN MENGANGKAN PENGRAPAKAN MAN ALABAMAMAMAMAMAM MANAGAM ARABAR ARABAR ARABARA ARABARA ARABARA ARABARA ARABARA ARABARA ARABARA ARABARA ARABARA ARABARA ARABARA NAME AND ADDRESS OF THE PROPERTY OF THE PROPER RIGID FORMAT SERIES M MINIMARIAN PROPERTY OF THE PRO MMMINISTERMENT A RECOMMENDATION OF THE PROPERTY OF THE PROPERT LEVEL 15.5.3 PARTICLE DESCRIPTION DE PRODUCTION DE MANAGEMENT DE PRODUCTION DE LA PRODU MEMORANG MANUAL MARKANA MARKANA MANAKANA PARADODANISAMIA MMMMMM: MMMMIA MMMMMMMMMM /I/M --MM MMMMMM MMMMM MMMM MMMM MINIMANAMAMA Managam ммммммм MARIAMARI / / / /// M MM - - MMM MMM M53M M MMM MMMM MMMM MM ANALYSISSIAL STATE MMARAM MEMMANN M 11111111 MMMM MM - - MMMMM MANAGEMENT M MMM MM MMM MMMMM MM MMRAMMANIAM M MINIM MMMM// /// ////MMM MMMM - - MMMMMMM ADMINISTRACTION. M MMM MMM MM MMMM ММ MMMSSMSMMM MM MM 1111 111 MMCCAMMIMM ---M MIMMIMMM MMMMMMMM MMM MM MMMM MM MMMM MM MMMM MMMMMMMMMMM / /// ///MM MMMMMMMM - - - M MAMMAMM MMMMMMMM MMMMMM MMMM MMMMMM MM // M 11111 MISSIMMAI - - - MMMM. MMMMM MMMMMMMM M MMM MMMMMMMMMMM MM MMMMM MMMMMMM MMM MMM - - - - MMMM MM/////// MMMMMET M MMMM MMMMMMM Μ MMM MMMM MM MM MMMM ////MMMMMMM MM 63.4FMMMMMM MAMMA - - - - 1.1 MIM MMM MASSAGA MM MMMM MMMMMM MMMM MM MMM

SYSTEM GENERATION DATE - 12/31/74

GIMMANATOMENTAL INTERCAMENTAL
MINAGENIA SEGMINA DELLA - - - MATA CAMARA SA ANG DELA PARA SEGMINA SEGMINA SEGMINA DELLA SEGMINA SEGMINA - - - MATA CAMARA SEGMINA SEG

- MINIMPARAMANANIAN ANIMPARAMANANIAN BERUMPARAMANANIAN MARAMANANIAN MARAMANANAN MARAMANANAN MARAMANAN MARAMANAN

parketen in the control of the resemble of the control of the cont

1

```
$ START OF EXECUTIVE CONTROL *******************************
ID CLASS PROBLEM SEVENTEEN, C.E. JACKSON
$
$ MAXIMUM CPU TIME ALLOWED FOR THE JOB
$
TIME 10
$ THE THERMAL ANALYZER PORTION OF NASTRAN IS TO BE USED
APP HEAT
$ THE NON-LINEAR STEADY-STATE SOLUTION ALGORITHM IS TO BE USED
SOL 3
$
$ REQUEST FOR DIAGNOSTIC WHICH PRINTS OUT CONVERGENCE CRITERIA
$ PRODUCES OUTPUT ONLY FOR SOL 3
DIAG 18
CEND
```

THE REAL PROPERTY.

NISS PROBLEM SAME AS PROBLEM SIXTEEN BUT WITH A BETTER GUESS

CASE CONTROL DECK ECHO

```
CARD
COUNT
1
     ~
2
     3
     4
5
6
     TITLE= NLSS PROBLEM ... SAME AS PROBLEM SIXTEEN. BUT WITH A BETTER GUESS VECTOR
7
     SUBTITLE= AND AN ELFORCE OUTPUT REQUEST.
8
     $
9
     $ SPECIFY 51 LINES OF DATA PER PAGE (DOES NOT INCLUDE HEADINGS AT TOP OF PAGE)
10
     ¢.
11
     LINE=51
12
     $
13
     $ REQUEST SORTED AND UNSORTED OUTPUT
14
     $ IF THIS CARD IS OMITTED. ONLY THE SORTED BULK DATA WILL APPEAR
15
16
     ECHO=BOTH
17
     $ SELECT THE SPC. MPC. AND LOAD SETS TO BE USED IN THIS SOLUTION
18
19
     Œ.
20
     SPC=100
21
     MPC=200
22
     10AD=300
23
24
     $ SELECT THE TEMPERATURE SET WHICH IS AN ESTIMATE OF THE FINAL SOLUTION VECTOR
25
26
     TEMP(MATERIAL)=400
27
28
     $ SELECT THE OUTPUT DESIRED(TEMPERATURES, LOADS, CONSTRAINT FORCES, AND
29
     $ GRADIENTS AND HEAT FLOWS)
30
     $
31
     OUTPUT
32
     THERMAL = All
33
     OLOAD=ALL
34
     SPCF=ALL
35
36
     $ REQUEST ELEMENT GRADIENT AND HEAT FLOW OUTPUT
37
38
     ELFORCE=ALL
39
40
     41
     42
43
44
     BEGIN BULK
```

3

INPUT BULK DATA DECK ECHO

```
1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 ... 9 .. 10 .
S UNITS MUST BE CONSISTENT
S IN THIS PROBLEM, METERS, WATTS, AND DEGREES CELSIUS ARE USED
S DEFINE GRID POINTS
GRID
                       Ο.
GRID
       2
                               ٥.
                                      Ο.
                       . 1
                       . 2
                                      Ο.
GRID
        3
                       . 3
                                      Ο.
GRID
        4
        5
                                      0.
GRID
                       ο.
                               . 1
GRID
        6
                       . 1
                                      Ο.
GRID
        7
                       . 2
                               . 1
                                      ο.
GRID
        8
                       . 3
                               . 1
                                      Ο.
                       Ο.
                               . 2
                                      Ο.
GRID
        9
GRID
       10
                       Ο.
                               - . 1
                                      Ο.
                       -.05
GRID
      100
                               .05
                                       Ο.
S CONNECT GRID POINTS
5
CROD
        10
                100
                       10
                               2
                100
                       9
                               6
CROD
        20
                                              5
                200
                       1
                               2
                                       6
CQUAD2 30
                       2
CQUAD2 40
                200
                                       7
CQUAD2 50
                200
                       3
$ DEFINE CROSS-SECTIONAL AREAS AND/OR THICKNESSES
PROD 100
                1000
                       .001
PQUAD2 200
                1000
                       .01
$ DEFINE MATERIAL THERMAL CONDUCTIVITY
$
                                                                      ALUMINUM
MAT4 1000
                200.
S DEFINE CONVECTIVE AREA AND CONVECTIVE COEFFICIENT 'H'
CHBDY 60
                300
                       LINE
                                       5
                                                                      +CONVEC
+CONVEC 100
                100
                3000
                        .314
PHBDY
        300
MAT4
        3000
                200.
S
$ DEFINE CONSTRAINTS
$
MPC
        200
                               1.
                                                       -1.
MPC
        200
                10
                               1.
                                       1
                                                       -1.
S DEFINE APPLIED LOADS
$
SLOAD 300
              1
                       4.
                               2
                                       8.
```

```
INPUT BULK DATA DECK FCHO
                               5 ..
                                      6 .. 7 .. 8 .. 9 .. 10 .
SLOAD
     300
              3
                    8.
                           4
                               . 4
SLOAD
       300
              5
                     4.
                            6
                                   8.
SLOAD
       300
              7
                     8.
                            Я
                                   4.
$ THE FOLLOWING BULK DATA CARDS WERE ADDED TO CONVERT PROBLEM ONE TO
$ PROBLEM TWO. THE ONLY BULK DATA CAPD REMOVED FROM THE PREVIOUS SOLUTION WAS
$ THE SPC CARD
$ THIS SPC1 CARD REPLACES THE SPC CARD REMOVED FROM ABOVE
SPC1 100
                     100
$ RADIATION BOUNDARY ELEMENTS
$
                     ΔRΕΔ4
CHEDY
       200
              2000
CHBDY
       300
              2000
                     AREA4
                          2
                                          7
CHBDY
       400
              2000
                     ΔΕΕΔ4
                           3
              2000
                     AREA4
CHEDY
       500
                           5
CHBDY
       600
              2000
                     AREA4
                            6
                                          3
                                                 2
CHBDY
     700
              2000
                     AREA4
                           7
                                                 3
& EMISSIVITY OF RADIATING ELEMENT
$
PHBDY 2000
                            . 90
S ESTIMATE OF FINAL STEADY STATE SOLUTION VECTOR --- REFERENCED
$ BY TEMP(MATERIAL) IN CASE CONTROL
                     300.
SEMP
       400
              100
$EMPD
       400
              300.
S PARAMETERS CONTROLLING RADIATION LOADING AND THE ITERATION LOOPING
S
PARAM TABS
              273.15
PARAM SIGMA 5.685E-8
PARAM
       MAXIT 8
PARAM EPSHT
             .0001
S DEFINITION OF THE RADIATION MATRIX
S ALL OF THE RADIATION GOES TO SPACE
              300
                     400
                            500
                                   600
                                          700
SADLST 200
                     Ο.
                            Ο.
                                   ο.
                                          0:
                                                 0.
RADMIX 1
              0.
                            Ο.
RADMIX 2
              Ο.
                     ο.
                                   0.
                                          Ο.
RADMIX 3
                     ٥.
                            ٥.
                                   ο.
              ٥.
RADMIX 4
              ٥.
                     0.
                            Ο.
RADMTX 5
              Ο.
                     Ο.
```

RADMTX 6

5

INPUT BULK DATA DECK ECHO

. 1	2	3	4	, 5	6	7	8 .	. 9 10 .
\$ * * * * * *	*******	*******	*********	*******	********		************ TWO TO DDOD	**************
								LEM SIXTEEN.
								E RADIATING FIN.
								FIN TO THE
		KLACES MI	11CH 15 L	DEPENDE	NI ON INE	HICKN	ESS OF THE	MULITEATER
\$ INSUL		4516-	D11111 DAT					
		E RADLST						
							N CHANGED.	THOUGH IT IS
		ACCURATE						
								OF THE FINAL
\$ 30101	TON AT	EACH POIN	NI, INGN	CONVER	SENCE WIL	L OCCUR	•	
\$ \$								
	ATMOULD:	C COTO O	STATE AND	CHECK	CADDE D	TIME TH	C NEW DADIA	TING CUREAGES
					CARDS DI	FFINE IH	E NEW RADIA	TING SURFACES.
\$ NOTE	INAI CC	NVECTION	IS SPEC.	IFIED.				
GRID	11		٥.	Ο.	С.			
GRID	12		.1	o.	0.			
GRID	13		. 2	0.	0.			
GRID	14		. 3	0.	0.			
GRID	15		0.	. 1	0.			
GRID	16		. 1	. 1	0.			
GRID	17		. 2	. 1	0.			
GRID	18		.3	. 1	o.			
GRID	21		. 0.	Ö.	0.			
GRID	22		.1	õ.	Ö.			
GRID	23		. 2	o.	Ö.	•		
GRID	24		. 3	Õ.	Ū.			
GRID	25		0.	. 1	0			
GRID	26		. 1	. 1	Ο.			
GRID	27		. 2	. 1	Ο.			
GRID	28		. 3	. 1	Ο.			
CHBDY	1200	2001	AREA4	11	12	16	15	+MULT1
+MULT1	1	2	6	5				
CHBDY	1300	2001	AREA4	12	13	17	16	+MULT2
+MULT2	2	3	7	6				
CHEDY	1400	2001	AREA4	13	14	18	17	+MULT3
+MULT3	3	4	8	7				
CHBDY	2500	2001	AREA4	25	26	22	21	+MULT10
+MULT10	-	6	2	1	0.5	••		
CHBDY	2600	2001	AREA4	26	27	23	22	+MULT11
+MULT1	2700	7 2001	3 AREA4	2 27	28	24	00	
+MULT1:		8	4	3	28	24	23	+MULT12
\$	2 /	8	4	3				
-	NE THE	EMISSIVIT	V AND CO	MVECTIV	E COEFFI	CIENT		
\$ 0571	VE INC I	-MIT 2 2 1 4 1 1	I AND CO	MAFCITA	- COEFFI	CIENI		
5 FHBDY	2001	2002		9				
MAT4	2002	1.		3				
\$	2002	• •						
	ACE THE	OLD RADL	ST CARD	WHICH W	AS REMOV	ED FROM	THE ORIGINA	AL BULK DATA.

NLSS PROBLEM . SAME AS PROBLEM SIXTEEN, BUT WITH A BETTER GUESS JANUARY 1, 1976 NASTRAN 12/31/74 PAGE
AND AN ELFORCE OUTPUT REQUEST.

INPUT BULK DATA DECK ECHO

. 1 .. 2 .. 3 ... 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 . \$ THIS IS REQUIRED TO FORCE THE RADIATIVE LOSSES TO COME FROM THE OUTSIDE OF \$ THE MULTILAYER INSULATION. RADIST 1200 1300 1400 2600 2500 S CONVERT PROBLEM SIXTEEN TO PROBLEM SEVENTEEN BY CHANGING THE THERMAL \$ GUESS VECTOR. THE ONLY CHANGE TO THE PREVIOUS BULK DATA HAS BEEN THE 5 CONVERSION OF THE OLD GUESS VECTOR TO JAMENT CARDS. \$ THE ONLY OTHER CHANGE WAS THE ADDITION OF AN ELFORCE=ALL OUTPUT REQUEST TEMP 400 330. 330. 330. TEMP 400 4 330. 5 330. 6 330. TEMP 400 7 330. В 330. q 330. 330. 300. TEMP 400 10 100 TEMPD 400 70. \$ ENDDATA

TOTAL COUNT= 174

*** USER INFORMATION MESSAGE 207. BULK DATA NOT SORTED.XSORT WILL RE-ORDER DECK.

			5.5							
CARD			5 0	RTED	вυ L	K DA	TAE	сно		
COUNT	. 1	2	3	4	5	6	7	8	9	10 .
1 -	CHBDY	60	300	LINE	1	5	,	0	9	+CONVEC
2 -	+CONVEC		100		•	•				TONVEC
3-	CHEDY	200	2000	AREA4	1	2	6	5		
4-	CHEDY	300	2000	AREA4	2	3	7	6		
5-	CHBDY	400	2000	AREA4	3	4	8	7		
6-	CHEDY	500	2000	AREA4	5	6	2	i		
7 -	CHBDY	600	2000	AREA4	6	7	3	2		
8-	CHBDY	700	2000	AREA4	7	8	4	3		
9-	CHEDY	1200	2001	AREA4	11	12	16	15		+MULT1
10-	+MULT1	1	2	6	5					TINOLII
11-	CHBDY	1300	2001	AREA4	12	13	17	16		+MULT2
12-	+MULT2	2	3	7	6	10	.,	10		THOLIZ
13-	CHBDY	1400	2001	AREA4	13	14	18	17		AMILI TO
14-	+MULT3	3	4	8	7		, ,	.,		+MULT3
15-	CHBDY	2500	2001	AREA4	25	26	22	21		+MULT10
16-	+MULT10		6	2	1	20	2.6	21		THOLITO
17-	CHBDY	2600	2001	AREA4	26	27	23	22		+MULT11
18-	+MULT11		7	3	2	2.		22		THOLIT
19-	CHBDY	2700	2001	AREA4	27	28	24	23		+MULT12
20-	-MULT12	7	8	4	3	20	24	23		THIOLITZ
21-	CQUAD2	30	200	1	2.	6	5			
22-	COUAD2	40	200	2	3	7	6			
23 -	CQUAD2	50	200	3	4	8	7			
24-	CROD	10	100	10	2	6	,			
25 -	CROD	20	100	9	6					
26-	GRID	1	100	0.0	0.0	0.0				
27-	GRID	2		,1	0.0	0.0				
28 -	GRID	3		. 2	0.0	0.0				
29-	GRID	4		.3	0.0	0.0				
30-	GRID	5		0.0	. 1	0.0				
31 -	GRID	6		. 1	.1	0.0				
32 -	GRID	7		. 2	. 1					
33 -	GRID	8		.3	. 1	0.0				
34 -	GRID	9		0.0	. 2	0.0				
35-	GRID	10		0.0		0.0				
36-	GRID	11		0.0	1 D.O	ს.0 0.0				
37-	GRID	12		.1						
38-	GRID	13		. 2	0.0	0.0				
39-	GRID	14			0.0	0.0				
40 -	GRID	15		.3 0.0	0.0	0.0				
41 -	GRID	16		, 1	.1	0.0				
42 -	GRID	17		. 2	. 1	0.0				
43 -	GRID	18		.3	. 1	0.0				
44-	GRID	21		0.0	. 1	0.0				
45-	GRID	22			0.0	0.0				
46-	GRID	23		. 1 . 2	0.0	0.0				
47 -	GRID	24		.3	0.0	0.0				
48-	GRID	25		0.0	0.0	0.0				
49-	GRID	26		.1	. 1	0.0				
50-	GRID	27		. 2	. 1 . 1	0.0				
51 -	GRID	28		.3	.1	0.0				
•	211.10	0		. 5		0.0				

			s o	RTED	BUL	K DA	TAE	Сно	
CARD							-		
COUNT	. 1	2	3	4	5	6	7	8 .	. 9 10 .
52-	GRID	100		05	. 05	0.0			
53-	MAT4	1000	200.						ALUMINUM
54-	MAT4	2002	1.						
55-	MAT4	3000	200.						
56-	MPC	200	9	1	1.	5	1	-1.	
57-	MPC	200	10	1	1.	1	1	-1.	
58-	PARAM	EPSHT	.0001						
59~	PARAM	TIXAM	8						
60 -	PARAM	SIGMA	5.685E-	8					
61 −	PARAM	TABS	273.15						
62 -	PHBDY	300	3000	.314					
63-	PHBDY	2000			. 90				
64 -	PHBDY	2001	2002		.9				
65 -	PQUAD2	200	1000	.01					
6 6-	PROD	100	1000	. 001					
67-	RADLST	1200	1300	1400	2500	2600	2700		
68 -	RADMTX	1	0.0	0.0	0.0	0.0	0.0	0.0	
69-	RADMIX	2	0.0	0.0	0.0	0.0	0.0		
70-	RADMIX	3	0.0	0.0	0.0	0.0			
71 -	RADMTX	4	0.0	0.0	0.0				
72 -	RADMTX	5	0.0	0.0					
73-	RADMIX	6	0.0						
74 -	SLOAD	300	1	4.	2	8.			
75-	SLOAD	300	3	8.	4	4.			
76-	SLOAD	300	5	4.	6	8.			
77-	SLOAD	300	7	8.	8	4.			
78-	SPC1	100	1	100					
79-	TEMP	400	1	330.	2	^3O.	3	330.	
80 -	TEMP	400	4	330.	5	33 0.	6	330.	• • • • • • • • • • • • • • • • • • • •
81 -	TEMP	400	7	330.	8	330.	9	330.	
82 -	TEMP	400	10	330.	100	300.			
83 -	TEMPD	400	70.						
	ENDDATA								

NO ERRORS FOUND - EXECUTE NASTRAN PROGRAM

*** USER INFORMATION MESSAGE FULL INTERNAL SPACE NODE AVAILABLE

*** USER INFORMATION MESSAGE . 6 ELEMENTS HAVE A TOTAL VIEW FACTOR (FA/A) LESS THAN 0.99

*** USER INFORMATION ME3SAGE 3023, B = 3
C = 0
R = 2

*** USER INFORMATION MESSAGE 3027, SYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

- *** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKFF HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 1
- *** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKSF HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2
- *** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HKFS
 HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2
- *** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PORTITIONING MODULE FOR SUB-PARTITION HKSS HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 1
- *** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HRFN
 HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2
- *** SYSTEM WARNING MESSAGE 2169, THE FORM PARAMETER AS GIVEN TO THE PARTITIONING MODULE FOR SUB-PARTITION HRSN
 HAS NOT BEEN SET OR IS OF ILLEGAL VALUE. IT HAS BEEN RESET = 2

O SECONDS.

- *** USER INFORMATION MESSAGE 3028, B = 12 BBAR = 13 C = 11 CBAR = 8 R = 23
- *** USER INFORMATION MESSAGE 3027, UNSYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS

DIAG 18 OUTPUT FROM SSGHT

*** USER INFORMATION MESSAGE 3086, ENTERING SSGHT EXIT MODE BY REASON NUMBER 1 (NORMAL CONVERGENCE)

The same of

NLSS PROBLEM ... SAME AS PROBLEM SIXTEEN, BUT WITH A BETTER GUESS JANUARY 1, 1976 NASTRAN 12/31/74 PAGE AND AN ELFORCE OUTPUT REQUEST.

9

TEMPERATURE VECTOR

POINT ID.	TYPE	ID VALUE	ID+1 VALUE	ID+2 VALUE	ID+3 VALUE	ID+4 VALUE	ID+5 VALUE
1	S	3.047539E 02	3.098955E 02	3.173071E 02	3.197708E 02	3.047539E 02	3.098955E 02
7	S	3.173071E 02	3.197708E 02	3.047539E 02	3.047539E 02	9.320056E 00	1.032129E 01
13	S	1.144310E 01	1.175737E 01	9.320256E 00	1.032132E 01	1.144313E 01	1.175758E 01
21	5	9.320257E 00	1.032132E 01	1.144313E 01	1.175758E 01	9.320056E 00	1.032129E 01
27	S	1.144310E 01	1.175737E 01				
100	5	3 000000F 02					

NLSS PROBLEM ... SAME AS PROBLEM SIXTEEN, BUT WITH A BETTER GUESS JANUARY 1, 1976 NASTRAN 12/31/74 PAGE 10 AND AN ELFORCE GUTPUT REQUEST.

LOAD VECTOR

POINT ID.	TYPE	ID VALUE	ID+1 VALUE	ID+2 VALUE	ID+3 VALUE	ID+4 VALUE	ID+5 VALUE
1	S	4.000000E 00	8.000000E CC	8.000000E 00	4.000000E 00	4.000000E 00	8.000000E 00
7	S	8.000000E 00	4.000000E 00				

NLSS PROBLEM ... SAME AS PROBLEM SIXTEEN, BUT WITH A BETTER GUESS JANUARY 1, 1976 NASTRAN 12/31/74 PAGE 11 AND AN ELFORCE OUTPUT REQUEST.

FORCES OF SINGLE-POINT CONSTRAINT

POINT ID. TYPE ID VALUE ID+1 VALUE ID+2 VALUE ID+3 VALUE ID+4 VALUE ID+5 VALUE 100 S -2.985400E 01

NLSS PROBLEM ... SAME AS PROBLEM SIXTEEN, BUT WITH A BETTER GUESS JANUARY 1, 1976 NASTRAN 12/31/74 PAGE 12
AND AN ELFORCE OUTPUT REQUEST.

FINITE ELEMENT TEMPERATURE GRADIENTS AND HEAT FLOWS

ELEMENT-ID	EL-TYPE	X-GRADIENT	Y-GRÀDIENT	Z-GRADIENT	X-FLOW	Y-FLOW	Z-FLOW
10	ROD	5.141602E 00			-1.028320E 03		
20	POD	5 141602F 00			-1 028320F 03		

JANUARY 1, 1976 NASTRAN 12/31/74

PAGE 13

FINITE ELEMENT TEMPERATURE GRADIENTS AND HEAT FLOWS

ELEMENT - ID	EL-TYPE	X-GRADIENT	Y-GRADIENT	Z-GRADIENT	X-FLOW	Y-FLOW	Z-FLOW
30	OUAD2	5.141602E 01	0.0		-1.028320E 04	0.0	•
40	QUAD2	7.411621E 01	0.0		-1.482324E 04	0.0	
50	QUAD2	2.463623E 01	0.0		-4.927246E 03	0.0	

HEAT FLOW INTO HBDY ELEMENTS (CHBDY)

ELEMENT - ID	APPLIED-LOAD	CONVECTION	RADIATION	TOTAL
60	0.0	-2.985451E 01	0.0	-2.985451E 01
200	0.0	0.0	0.0	0. 0
300	0.0	0.0	0.0	0.0
400	0.0	υ.ο	0.0	0.0
500	0.0	0.0	0.0	0.0
600	0.0	0.0	0.0	0.0
700	0.0	0.0	0.0	0.0
1200	0.0	2.975034E 00	-3.280534E 00	-3.055000E-01
1300	0.0	3.027185E 00	-3.330055E 00	-3.028698E-01
1400	0.0	3.069382E CO	-3.363784E 00	-2.944021E-01
2500	0.0	2.975034E 00	-3.280534E 00	-3.055000E-01
2600	0.0	3.0271858 00	-3.330055E 00	-3.028698E-01
2700	0.0	3.069382E 00	-3.363783E 00	-2.944012E-01

```
NASTRAN LOADED AT LOCATION OF AF 20
TIME TO GO = 59 CPU SEC. 238 I/O SEC.
     O CPU-SEC.
                        O ELAPSED-SEC.
                                            SEM1
                                                   BEGN
                                            SEMT
     O CPU-SEC.
                        O ELAPSED-SEC.
     O CPU-SEC.
                        2 ELAPSED-SEC.
                                            NAST
                                            GNFI
     O CPU-SEC.
                        3 ELAPSED-SEC.
     O CPU-SEC.
                        3 FLAPSED-SEC.
                                            XCSA
                                            IFP1
     1 CPU-SEC.
                        3 ELAPSED-SEC.
                        5 ELAPSED-SEC.
                                            XSOR
     1 CPU-SEC.
                                                  IFP
     1 CPU-SEC.
                       10 ELAPSED-SEC.
                                              DO
     2 CPU-SEC.
                       23 FLAPSED-SEC.
                                              END
                                                   IFP
     2 CPU-SEC.
                       23 ELAPSED-SEC.
                                             XGPI
     3 CPU-SEC.
                       27 ELAPSED-SEC.
                                             SEM1 END
                                                   LINKNSO2 ---
                       27 ELAPSED-SEC.
     3 CPU-SEC.
    21 I/O SEC.
LAST LINK DID NOT USE
                              O BYTES OF OPEN CORE
                                                   LINK END ---
     3 CPU-SEC.
                       29 ELAPSED-SEC.
                                             XSFA
     3 CPU-SEC.
                       29 ELAPSED-SEC.
                                             XSFA
     3 CPU-SEC.
                       30 ELAPSED-SEC.
                                                   GP1
     3 C.PU-SEC.
                       30 ELAPSED-SEC.
                                             2
                                                           BEGN
                                                   GP 1
                                                           FND
     3 CPU-SEC.
                       34 ELAPSED-SEC.
                                             2
     3 CPU-SEC.
                       15 ELAPSED-SEC.
                                             5
                                                   GP2
                                                            BEGN
     3 CPU-SEC.
                                                   GP2
                                                            END
                       C.6 ELAPSED-SEC.
                                                   PLTSET
     3 CPU-SEC.
                       36 ELAPSED-SEC.
                                             7
                                                           BEGN
     3 CPU-SEC.
                       16 ELAPSED-SEC.
                                                   PLTSET
                                                   PRIMSG
     4 CPU-SEC.
                       37 ELAPSED-SEC.
                                                            BEGN
      4 CPU-SEC.
                                                   PRIMSG
                       37 ELAPSED-SEC.
                                             9
                                                            FND
      4 CPU-SEC.
                       37 ELAPSED-SEC.
                                                   SETVAL
                                                            BEGN
                                             10
      4 CPU-SEC.
                        57 ELAPSED-SEC.
                                             10
                                                   SETVAL
                                                            END
     4 CPU-SEC.
                        39 ELAPSED-SEC.
                                             18
                                                   GP3
                                                            BEGN
     4 CPU-SEC.
                       44 ELAPSED-SEC.
                                             18
                                                   GP3
                                                            END
                                                            BEGN
      4 CPU-SEC.
                        44 ELAPSED-SEC.
                                             20
                                                   T \Delta 1
     4 CPU-SEC.
                        51 ELAPSED-SEC.
                                             20
                                                   TA1
                                                            END
      4 CPU-SEC.
                        52 ELAPSED-SEC.
                                                   LINKNSO3 ---
    51 I/O SEC.
LAST LINK DID NOT USE 41828 BYTES OF OPEN CORE
      4 CPU-SEC.
                        55 ELAPSED-SEC.
                                             ---- LINK END ---
                                             24
                                                            BEGN
      4 CPU-SEC.
                        55 ELAPSED-SEC.
                                                   SMA1
      4 CPU-SEC.
                        59 ELAPSED-SEC.
                                             24
                                                   SMA1
                                                            END
     4 CPU-SEC.
                        59 ELAPSED-SEC.
                                                   LINKNSO5 ---
    57 I/O SEC.
LAST LINK DID NOT USE 23308 BYTES OF OPEN CORE
                                             ---- LINK END ---
      4 CPU-SEC.
                       62 ELAPSED-SEC.
      4 CPU-SEC.
                        62 ELAPSED-SEC.
                                             27
                                                   RMG
                                                            BEGN
      4 CPU-SEC.
                        65 ELAPSED-SEC.
                                             SDCO
                                                   MP
      4 CPU-SEC.
                        66 ELAPSED-SEC.
                                             SDCO
                                                   MP
                                             FBS
      4 CPU-SEC.
                        67 ELAPSED-SEC.
      5 CPU-SEC.
                        69 ELAPSED-SEC.
                                             FBS
      5 CPU-SEC.
                        69 ELAPSED-SEC.
                                             MPYA
                                                   D
                                                   METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                    0.0
                                             MPYA
                                                  D
      5 CPU-SEC.
                        70 ELAPSED-SEC.
                                             TRAN POSE
      5 CPU-SEC.
                        70 ELAPSED-SEC.
      5 CPU-SEC.
                        72 ELAPSED-SEC.
                                             TRAN
                                                  POSE
      5 CPU-SEC.
                        72 ELAPSED-SEC.
                                             MPYA
                                                   METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                    0.0
                                             MPYA D
      5 CPU-SEC.
                        73 ELAPSED-SEC.
```

```
RMG
                                                         END
     5 CPU-SEC.
                       75 ELAPSED-SEC.
                                           27
                                                 LINKNSO4 ---
     5 CPU-SEC.
                      76 ELAPSED-SEC.
    72 I/O SEC.
LAST LINK DID NOT USE 31560 BYTES OF OPEN CORE
                      SO ELAPSED-SEC.
                                           ---- LINK END ---
     5 CPU-SEC.
     5 CPU-SEC.
                                                 GP4
                                                          BEGN
                       80 ELAPSED-SEC.
                                           32
                                                          END
     5 CPU-SEC.
                      85 ELAPSED-SEC.
                                           32
                                                 GP4
                                                 GPSP
                                                          BEGN
                                           38
     5 CPU-SEC.
                       E6 ELAPSED-SEC.
                                                 GPSP
                                                          END
     5 CPU-SEC.
                       £7 ELAPSED-SEC.
                                           38
                                                 LINKN514 ---
                       £7 ELAPSED-SEC.
     5 CPU-SEC.
    84 I/O SEC.
LAST LINK DID NOT USE 76084 BYTES OF OPEN CORE
                                           ---- LINK END ---
     5 CPU-SEC.
                       91 ELAPSED-SEC.
     5 CPU-SEC.
                       91 ELAPSED-SEC.
                                           39
                                                 OFP
                                                          BEGN
                                           39
                                                 OFP
                                                          END
     5 CPU-SEC.
                       52 ELAPSED-SEC.
                       93 ELAPSED-SEC.
                                           ----
                                                 LINKNSO4 ---
     6 CPU-SEC.
    88 I/O SEC.
LAST LINK DID NOT USE 74704 BYTES OF OPEN CORE
                                            ---- LINK END ---
     6 CPU-SEC.
                       96 ELAPSED-SEC.
                                            42
                                                  MCE1
                                                          BEGN
     6 CPU-SEC.
                       96 ELAPSED-SEC.
                                            42
                                                  MCE1
                                                          END
     6 CPU-SEC.
                       S9 ELAPSED-SEC.
                                            44
                                                  MCE2
                                                          BEGN
     6 CPU-SEC.
                       99 ELAPSED-SEC.
                                            MPYA D
     5 CPU-SEC.
                      101 ELAPSED-SEC.
                                                                                                  0.0
                                                  METHOD 2 NT. NBR PASSES = 1.EST. TIME =
     6 CPU-SEC.
                      102 ELAPSED-SEC.
                                            MPYA
     S CPU-SEC.
                      103 ELAPSED-SEC.
                                            MPYA
                                                                                                  0.0
                                                  METHOD 2 T .NBR PASSES =
                                                                             1.EST. TIME =
     6 CPU-SEC.
                      104 ELAPSED-SEC.
                                            MPYA
                                                  D
                      105 ELAPSED-SEC.
                                            MPYA D
     6 CPU-SEC.
                                                  METHOD 2 T .NBR PASSES =
                                                                             1,EST. TIME =
                                                                                                  0.0
                      106 ELAPSED-SEC.
                                            MPYA
     7 CPU-SEC.
     7 CPU-SEC.
                                            MPYA
                                                  D
                      108 ELAPSED-SEC.
                                                                                                  0.0
                                                  METHOD 2 NT.NBR PASSES =
                                                                              1.EST. TIME =
     7 CPU-SEC.
                      110 ELAPSED-SEC.
                                            MPYA
     7 CPU-SEC.
                      110 ELAPSED-SEC.
                                            MPYA
                                                                                                  0.0
                                                  METHOD 2 T .NBR PASSES =
                                                                             1.EST. TIME =
                                            MPYA D
     7 CPU-SEC.
                      111 ELAPSED-SEC.
     7 CPU-SEC.
                      111 ELAPSED-SEC.
                                            MPYA D
                                                                                                  0.0
                                                  METHOD 2 T .NBR PASSES = 1.EST. TIME =
     7 CPU-SEC.
                      112 ELAPSED-SEC.
                                            MPYA D
                                            44
                                                  MCE2
                                                          END
     7 CPU-SEC.
                      112 ELAPSED-SEC.
                                            ---- LINKNS07 ---
     7 CPU-SEC.
                      114 ELAPSED-SEC.
   106 I/O SEC.
LAST LINK DID NOT USE 68244 BYTES OF OPEN CORE
      B CPU-SEC.
                                            ---- LINK END ---
                      119 ELAPSED-SEC.
                      119 ELAPSED-SEC.
                                            50
                                                  VEC
                                                           BEGN
      8 CPU-SEC.
                                                           END
                                            50
                                                  VEC
      8 CPU-SEC.
                      119 ELAPSED-SEC.
                                            51
                                                  PARTN
                                                           BEGN
                      120 ELAPSED-SEC.
      8 CPU-SEC.
                                                  PARTN
                                                           END
                                            51
      8 CPU-SEC.
                      122 ELAPSED-SEC.
                                                           BEGN
                                                  PARTN
      8 CPU-SEC.
                      1:22 ELAPSED-SEC.
                                            52
                                            52
                                                  PARTN
                                                           END
      8 CPU-SEC.
                      123 ELAPSED-SEC.
                                                  DECOMP
                                                           BEGN
      8 CPU-SEC.
                      123 ELAPSED-SEC.
                                            55
                      124 ELAPSED-SEC.
                                            DECO
                                                 MP
      8 CPU-SEC.
                                            DECO
                                                  MP
      8 CPU-SEC.
                      125 ELAPSED-SEC.
                                            55
                                                  DECOMP
                                                          END
      B CPU-SEC.
                      128 ELAPSED-SEC.
                      129 ELAPSED-SEC.
                                            XSFA
      8 CPU-SEC.
                                            XSFA
      8 CPU-SEC.
                      130 ELAPSED-SEC.
                                                  LINKNSO5 ---
                      130 ELAPSED-SEC.
                                            ----
      8 CPU-SEC.
    118 I/O SEC.
 LAST LINK DID NOT USE 59592 BYTES OF OPEN CORE
                                                  LINK END ---
                      131 ELAPSED-SEC.
      8 CPU-SEC.
                                                           BEGN
                                            59
                                                  SSG1
      8 CPU-SEC.
                       131 ELAPSED-SEC.
                                                   SSG1
                                                           END
      8 CPU-SEC.
                       136 ELAPSED-SEC.
                                            59
                                                           BEGN
      8 C.PU-SEC.
                       137 ELAPSED-SEC.
                                            63
                                                   SSG2
```

```
8 CPU-SEC.
                     139 ELAPSED-SEC.
                                           MPYA
                                                D
                                                 METHOD 2 T .NBR PASSES =
                                                                                                0.0
                                                                            1.EST. TIME =
     3 CPU-SEC.
                     141 ELAPSED-SEC.
                                           MPYA
                                                D
     8 CPU-SEC.
                      143 ELAPSED-SEC.
                                           MPYA
                                                 METHOD 2 NT.NBR PASSES = 1.EST. TIME #
                                                                                                0.0
     9 CPU-SEC.
                      144 ELAPSED-SEC.
                                           MPYA
                                                D
     3 CPU-SEC.
                      144 ELAPSED-SEC.
                                           63
                                                 SSG2
                                                         END
     9 CPU-SEC.
                      145 ELAPSED-SEC.
                                           66
                                                 SSGHT
                                                         BEGN
     9 CPU-SEC.
                      155 ELAPSED-SEC.
                                                 SSGHT
                                           66
                                                         END
                      156 ELAPSED-SEC.
     9 CPU-SEC.
                                                 LINKNSOB ---
   145 I/O SEC.
LAST LINK DID NOT USE 24368 BYTES OF OPEN CORE
     9 CPU-SEC.
                      165 ELAPSED-SEC.
                                           ---- LINK END - -
     9 CPU-SEC.
                                           71
                      165 ELAPSED-SEC.
                                                 PLTTRAN BEGN
     9 CPU-SEC.
                      166 ELAFSED-SEC.
                                                 PLTTRAN END
                                           71
                                           ---- LINKNS13 ---
     9 CPU-SEC.
                      167 ELAPSED-SEC.
  151 I/O SEC.
LAST LINK DID NOT USE
                       73552 BYTES OF OPEN CORE
     9 CPU-SEC.
                      173 ELAPSED-SEC.
                                           ---- LINK END ---
     9 CPU-SEC.
                      173 ELAPSED-SEC.
                                           74
                                                 SDR2
                                                         BEGN
     9 CPU-SEC.
                      178 ELAPSED-SEC.
                                           74
                                                 SDR2
                                                         END
     9 CPU-SEC.
                                           ---- LINKNS14 ---
                      179 ELAPSED-SEC.
   161 I/O SEC.
LAST LINK DID NOT USE 25464 BYTES OF OPEN CORE
    10 CPU-SEC.
                      184 ELAPSED-SEC.
                                           ---- LINK END ---
    10 CPU-SEC.
                      184 ELAPSED-SEC.
                                           75
                                                 OFP
                                                         BEGN
    10 CPU-SEC.
                      185 ELAPSED-SEC.
                                                 OFP
                                           75
                                                         END
    10 CPU-SEC.
                      186 ELAPSED-SEC.
                                                 LINKNS13 ---
   168 I/O SEC.
LAST LINK DID NOT USE
                       68004 BYTES OF OPEN CORE
    10 CPU-SEC.
                      193 ELAPSED-SEC.
                                                 LINK END ---
    10 CPU-SEC.
                      193 ELAPSED-SEC.
                                           77
                                                        BEGN
                                                 SDRHT
    10 CPU-SEC.
                      194 ELAPSED-SEC.
                                           77
                                                 SDRHT
                                                        END
    10 CPU-SEC.
                      195 ELAPSED-SEC.
                                                 LINKNS14 ---
   179 I/O SEC.
LAST LINK DID NOT USE 25440 BYTES OF OPEN CORE
    10 CPU-SEC.
                      204 ELAPSED-SEC.
                                                LINK END ---
    10 CPU-SEC.
                      204 ELAPSED-SEC.
                                           78
                                                 OFP
                                                         BEGN
    10 CPU-SEC.
                      204 ELAPSED-SEC.
                                           78
                                                 OFP
                                                          END
    10 CPU-SEC.
                      206 ELAPSED-SEC.
                                                 EXIT
                                                          BEGN
= 182 I/O SEC.
LAST LINK DID NOT USE 68004 BYTES OF OPEN CORE
AMOUNT OF OPEN CORE NOT USED = OK BYTES
```

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MMM/ARSSASSMARGASMACGAM/ARSMAGAM/AR

IBM 360-370 SERIES MODELS 91.95

RIGID FORMAT SERIES M

LEVEL 15.5.3

MMMM

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SYSTEM GENERATION DATE - 12/31/74

```
$
ID CLASS PROBLEM EIGHTEEN, C.E. JACKSON
$ MAXIMUM CPU TIME ALLOWED FOR THE JOB.
TIME 10
$ THE THERMAL ANALYZER PORTION OF NASTRAN IS TO BE USED
APP - FEAT
$ THE NON-LINEAR TRANSIENT SOLUTION ALGORITHM IS TO BE USED
$
SOL 9
S REQUEST FOR DIAGNOSTIC WHICH PRINTS OUT CONVERGENCE CRITERIA
$ PRODUCES CUTPUT ONLY FOR SOL 3
DIAG 18
5 ACTIVATES THE DIAGNOSTIC WHICH PRINTS OUT THE DMAP CONTROL CARDS FOR THE
$ RIGID FORMAT SELECTED ABOVE (SOL 9)
$
DIAG 14
S ADD ADDITIONAL DMAP CONTROL CARDS TO PRINT OUT THE THERMAL MASS MATRIX.HBGG
ALTER 33
MATPAN HBGG.... // $
ENDALTER
3
CEND
```

CASE CONTROL DECK ECHO

```
CARD
COUNT
 2
       $ END OF EXECUTIVE CONTROL --- START CASE CONTROL ******************************
 3
 5
       6
 7
 8
       S SPECIFY 51 LINES OF DATA PER PAGE (DOES NOT .NCLUDE HEADINGS AT TOP OF PAGE)
9
10
       LINE=51
11
12
       $ REQUEST SORTED AND UNSORTED OUTPUT
       $ IF THIS CARD IS OMITTED. ONLY THE SORTED BULK DATA WILL APPEAR
13
14
15
       ECHO=BOTH
16
17
       $ SELECT THE MPC AND LOAD SETS TO BE USED IN THIS SOCUTION
       $ NOTE THAT NO SPC SET IS SELECTED. AND THAT DLOAD HAS REPLACED LOAD.
18
19
20
       MPC=200
21
       DLOAD=300
22
23
       $ SELECT THE TEMPERATURE SET WHICH IS AN ESTIMATE OF THE FINAL SOLUTION VECTOR
       $ THE SELECTION OF THIS SET IS OPTIONAL FOR SOL 9. BUT SHOULD BE MADE IF
24
        $ THE FINAL TEMPERATURE IS SEVERAL ! UNDRED DEGREES DIFFERENT FROM THE
25
26
       $ IC VECTOR, AND RADIATIVE INTERCHANGES ARE INCLUDED.
27
28
       TEMP(MATERIAL)=400
29
        $ SELECT THE STEP SIZE, NUMBER OF INCREMENTS, AND PRINTOUT FREQUENCY
30
31
32
       TSTEP=500
33
       S
34
       $ SELECT THE TEMPERATURE SET DEFINING THE TEMPERATURE VECTOR AT T=0.
35
36
       IC=500
37
       $ SELECT THE OUTPUT DESIRED (TEMPERATURES AND GRADIENTS AND HEAT FLOWS)
38
39
40
       OUTPUT
41
       S DEFINE THE TIMES AT WHICH OUTPUT IS DESIRED ... THE NEAREST AVAILABLE SOLUTION
42
43
       S TIMES TO THOSE TIMES LISTED BELOW WILL BE SELECTED FOR OUTPUT.
44
45
       SET 1 = 0. , 30. , 60. , 600. , 1200. , 1800.
46
47
       $ SELECT THE OTIME SET
48
49
       OTIME = 1
50
       $ DEFINE A GROUP OF GRID POINTS TO BE REFERENCED BY AN OUTPUT REQUEST
```

PAGE

CASE CONTROL DECK ECHO

```
CARD
COUNT
52
53
     SET 5 = 1,2,3,4,5,6,7,8,100
54
55
     $ REFERENCE A PREVIOUSLY DEFINED GROUP OF GRID POINTS
56
57
     THERMAL=5
58
59
     $ REQUEST ELEMENT GRADIENT AND HEAT FLOW CUTPUT
€0
€1
     ELFORCE=ALL
62
63
64
     65
66
67
      BEGIN BULK
```

INPUT BULK DATA DECK ECHO

```
1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 .
S UNITS MUST BE CONSISTENT
$ IN THIS PROBLEM, METERS, WATTS, AND DEGREES CELSIUS ARE USED
$ DEFINE GRID POINTS
GRID
                            Ο.
                                    0.
GRID
       2
                     . 1
                                    Ο.
GRID
       3
                     . 2
                                    С.
GRID
       4
                     . З
                                    Ο.
GRID
       5
                     0.
                             . 1
GRID
       6
                     . 1
                             . 1
                                    С.
GR1D
       7
                     . 2
                                    Ο.
                            . 1
GRID
                     3
                                    О.
                            . 1
GRID
                            . 2
GRID
       10
                     0.
                             - , 1
                                    ΰ.
GRID
                     -.05 .05
       100
$ CONNECT GRID POINTS
CROD
       10
              100
                     10
CROD
       20
              100
                     9
CQUAD2 30
              200
                     1
                                    6
                                           5
CQUAD2 40
              200
                     2
                             3
                                    7
CQUAD2 50
              200
                     3
S DEFINE CROSS-SECTIONAL AREAS AND/OR THICKNESSES
PROD 100
              1000
                      .001
PQUAD2 200
              1000
                     .01
$ DEFINE MATERIAL THERMAL CONDUCTIVITY AND THERMAL MASS
MAT4 1000
              200.
                     2.426+6
                                                                 ALUMINUM
$ DEFINE CONVECTIVE AREA AND CONVECTIVE COEFFICIENT 'H'
                                                                $
                     LINE 1 5
CHEDY 60
              300
                                                                 +CONVEC
+CONVEC 100
              100
PHEDY 300
              3000
                     . 314
MAT4
       3000
              200.
5
$ DEFINE CONSTRAINTS
$
MPC
       200
                             1.
                                                 -1.
MPC
       200
              10
S DEFINE APPLIED LOADS
SLOAD 30C
              1
                     4.
                             2
                                    8.
```

INPUT BULK DATA DECK ECHO

```
5 ..
                                          6 .. 7 .. 8 .. 9 .. 10 .
SLOAD 300
               3
                       B.
                                      4
SLOAD
       300
               5
                       4.
                               6
                                      8.
SLOAD 300
               7
                       8.
                               В
                                       4.
$ THE FOLLOWING BULK DATA CARDS WERE ADDED TO CONVERT PROBLEM ONE TO
S PROBLEM TWO. THE ONLY BULK DATA CARD R TOVED FROM THE PREVIOUS SOLUTION WAS
S THE SPC CARD
$ THIS SPC1 CARD REPLACES THE SPC CARD REMOVED FROM ABOVE
SPC1
      100
                       100
S RADIATION BOUNDARY ELEMENTS
CHBDY
       200
                2000
                       AREA4
CHBDY
       300
               2000
                       AREA4
                               2
CHBDY
       400
               2000
                       AREA4
                               3
CHBDY
       500
                2000
                       APEA4
                               5
                2000
                                               3
CHBDY
        600
                       AREA4
                               6
                               7
CHEDY
       700
                2000
                       AREA4
S EMISSIVITY OF RADIATING ELEMENT
PHBDY 2000
                               .90
S ESTIMATE OF FINAL STEADY STATE SOLUTION VECTOR --- REFERENCED
$ BY TEMP(MATERIAL) IN CASE CONTROL
TEMP
        400
                       300.
                100
TEMPD 400
                300.
S PARAMETERS CONTROLLING RADIATION LOADING AND THE ITERATION LOOPING
FARAM
       TABS
                273.15
PARAM
        SIGMA
               5.6355-8
        MAXIT
PARAM
PARAM
       EPSHT
               .0001
S DEFINITION OF THE RADIATION MATRIX
$ ALL OF THE RADIATION GOES TO SPACE
RADLST 200
                300
                       400
                               500
                                       600
                                               700
RADMIX 1
                Ο.
                       0.
                               0.
                                       ο.
                                               0.
                                                       ٥.
RADMIX 2
                0.
                       Ο.
                               Ο.
                                       ο.
                                               Ο.
RADMIX 3
                Ο.
                       Ο.
                               Ο.
                                       ο.
RADMIX 4
                Ο.
                       Ο.
                               Ο.
RADMIX
       5
                       ٥.
                ٥.
RADMTX 6
                Ο.
3
```

INPUT BULK DATA DECK ECHO

```
1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 .
$ THE FOLLOWING BULK DATA CARDS WERE ADDED FOR THE TRANSIENT SOLUTION --------
$ THEY CONVERT PROBLEM TWO TO PROBLEM THREE
$ NOTE THAT THE SPC1 SET WAS NOT SELECTED IN CASE CONTROL
$ NOTE THAT SPCF OUTPUT IS NOT REQUESTED IN TRANSIENT
S NOTE THAT THERMAL MASS WAS ADDED TO 'MAT4' CARD 1000
S NOTE THAT THE DIAG CARD IN THE EXECUTIVE CONTROL WAS IRRELEVANT
S NOTE THAT THE LOAD REQUEST IN CASE CONTROL IS NOW A DLOAD REQUEST
$ TRANSIENT SINGLE POINT CONSTRAINT METHOD
S CONSTRAIN GRID POINT 100 TO 300 DEGREES CELSIUS
CELAS2 300
                     100
              1.+5
SLOAD 300
              100
                     300.+5
$ DEFINES A CONSTANT LOAD SET APPLIED FROM T=0. TO T=1.+6 SECONDS
TLOAD2 300
              300
                                           1.+6
                                                   0.
                                                          0.
                                                                 +TL1
+TL1
       0.
              0.
$ DEFINES THE NUMBER OF INCREMENTS. THE STEP SIZE, AND THE PRINTOUT FREQUENCY
S REFERENCED IN CASE CONTROL AS 'TSTEP'
$ EACH TIME STEP IS 30 SECONDS
TSTEP 500
                     30.
$ DEFINES A TEMPERATURE VECTOR --- REFERENCED IN CASE CONTROL AS 'IC'
TEMPD 600
              300.
S
$ NO NEW BULK DATA CARDS WERE ADDED TO CONVERT PROBLEM THREE TO PROBLEM
$ EIGHTEEN. A DIAGNOSTIC REQUEST AND A DMAP ALTER WERE ADDED TO THE EXEC CONTROL
S AND AN OTIME SET WAS DEFINED AND SELECTED IN THE CASE CONTROL.
S TO REDUCE THE OUTPUT VOLUME. THE ONLY OUTPUT REQUESTED IN THIS
$ RUN IS THERMAL=5 AND ELFORCE=ALL.
$+***************************
ENDDATA
```

TOTAL COUNT= 144

*** USER INFORMATION MESSAGE 207, BULK DATA NOT SORTED.XSORT WILL RE-URDER DECK.

			s o	RTED	8 U L	K DA	T A E	СНО	
CARD									
COUNT						. 6 .	. 7	8 9 .	. 10 .
1 -	CELAS2	300	1.+5	100	1				
2 -	CHEDY	60	300	LINE	1	5			+CONVEC
3-	-CONVEC		100 .						
4 -	CHEDA	200	2000	AREA4	1	2	6	5	
5 <i>-</i>	CHEDY	300		AREA4	2	3	7	6	
6-	CHEDA	400	2000	AFEA4	3	4	8	7	
7 -	CHEDY	500	2000	AREA4	5	6	2 3	1	
8 -	CHSDA	600	2000	AREA4	6	7	3	2	
9 -	CHROA	700	2000	AREA4	7	8	4	3	
10-	CQUAD2	30	200	1	2	6	5 6		
11-	CON7D5	40	200	2	3	7	6		
12-	CGJAD2	50	200	3	4	8	7		
13-	CKSD	10	100	10	2				
14-	CROD	20	100	9	6				
15-	GRID	1		0.0	0.0	0.0 .			
16-	GRID	2		. 1	0.0	0.0			
17-	GRID	3		. 2	0.0	U.O			
18-	GRID	4		. 3	0.0	0.0			
19-	SRID	5		0.0	. 1	0.0			
20-	GRID	6		.1	. 1	0.0			
21 -	GRID	7		. 2	. 1	0.0			
22-	GRID	8		. 3	. 1	0.0			
23-	GRID	9		0.0	. 2	0.0			
24-	GRID	10		0.0	1	0.0			
25 -	GRID	100	000	05	. 05	0.0			
26-	MAT4	1000	200.	2.426+6					ALUMINUM
27-	MAT4	3000	200.	_					
28-	N°°C	200	9	1	1.		1	-1.	
29-	M. J. C	200	10	1	1.	1	1	-1.	
30-	PARAM	EPSHT	.0001						
31 -	PARAM	MAXIT	8						
32-	PARAM	SIGMA	5.685E-	5					
33-	PARAM	TABS	273.15	.3 4 4					
34 -	PHEDY	300	3000	.314	0.0				
35 - 36 -	YCEHA	2000	.000	.01	. 90				
37 -	PQUAD2 PROD	200	1000 1000						
38 -		100		.001 400	E00	600	700		
39-	RADLST RADMTX	200 1	300 0.0	0.0	500 0.0	0.0	0.0	0.0	
40-	RADMIX	2	0.0	0.0	0.0	0.0	0.0	0.0	
41 -	RADMIX	3	0.0	0.0	0.0	0.0	0.0		
42-	RADMIX	4	0.0	0.0	0.0	0.0			
43-	RADMIX	5	0.0	0.0	0.0				
44-	RADMIX	6	0.0	0.0					
45-	SLOAD	300	1	4.	2	8.			
46-	SLOAD	300	3	8.	4	4.			
47-	SLOAD	300	5	4.	6	8.			
48-	SLOAD	300	7	8.	8	4.			
49-	SLOAD	300	100	300.+5	J	⊸.			
50-	SPC1	100	1	100					•
51 -	TIMP	400	100	300.					
J.		.00							

PAGE

					S	0 8	2 3	E	Ð		В	U	Ĺ	K	0	Д	Ť	A		ε	C	н	0							
CARD CGUNT	1		2		3			4	,	, ,		5			6				7				8			9			10	
52-	TEMPO	400		300																										
53-	TEMPD	600		300																										
54-	TLOAD2	300		300										0.0			1	. +6	ŝ		٥.	0		0.	0		+	TL	1	
55-	+711	0.		٥.																										
56-	TSTEP ENDDATA	500		45		;	30.			1																				

NASTRAN SOURCE PROGRAM COMPILATION

DMAP INST	RUCTION
BEGIN	HEAT NO.9 TRANSIENT HEAT TRANSFER ANALYSIS \$
FILE	KGGX=TAPE/ KGG=TAPE \$
GP1	GEOM1.GEOM2./HGPL.HEQEXIN.HGPDT.HCSTM.HBGFDT.HSIL/V.N.HLUSET/V.N.HALWAYS=-1/V.N.HNOGPDT \$
SAVE	HLUSET, HNOGPOT\$
PURGE	HUSET.HGM,HGO,HKAA,HBAA.HPSO,HKFS,HQP,HEST/HNOGPDT \$
CHKPNT	HGPL.HEQEXIN.HGPDT.HCSTM,HBGPDT.HSIL.HUSET.HGM.HGO,HKAA,HBAA, HPSO,HKFS,HOP.HEST \$
COND	HLBL5: HNOGPOT\$
GP2	GEOM2.HEGEXIN/HECT \$
CHKPNT	HECT S
PLTSET	PCDB.HEQEXIN.HECT/HPLTSETX.HPLTPAR.HGPSETS.HELSETS/V.N.HNSIL/V.N.JUMPPLOT \$
SAVE	HNSIL.JUMPPLOT \$
PRTMSG	HPLTSETX//S
SETVAL	//v,N.HPLTFLG/C.N,1/v,N.HPFILE/C.N.O \$
SAVE	HPLTFLG.HPFILE \$
COND	HP1,JUMPPLOTS
PLOT	HPLTPAR, HGPSETS, HELSETS, CASECC, HBGPDT, HEQEXIN, HSIL, ./HPLOTX1/V,N, HNSIL/V,N, HLUSET/V,N, JUMPPLOT/V,N, HPLTFLG/V,N, HPFILE \$
SAVE	JUMPPLOT.HPLTFLG.HPFILE \$
PRTMSG	HPLOTX1//\$
LABEL	HP1 \$
CHKPNT	HPLTPAR, HGPSETS, HELSETS \$
GP3	GEOM3.HEQEXIN.GEOM2/HSLT.HGPTT/C.N.123/C.N.123/C.N.123 \$
CHKPNT	HGPTT.HSLT S
TA1.	.HECT.EPT.HBGPDT.HSIL,HGPTT.HCSTM/HEST.,HGEI.HECPT,HGPCT/ V.N.
	BEGIN FILE GP1 SAVE PURGE CHKPNT COND GP2 CHKPNT PLISET SAVE PRIMSG SETVAL SAVE COND PLOT SAVE PRIMSG LABEL CHKPNT GP3 CHKPNT

PAGE

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NASTRAN SOURCE PROGRAM COMPILATION
DMAP-DMAP INSTRUCTION
NO.
              HLUSET/C.N.123/V.N.HNOSIMP=-1/C.N.O/C.N.123/C.N.123 $
24 SAVE
              HNOSIMP $
 25 CHKPNT
              HEST. FECPT. HGPCT $
 26 COND
              HLBL1, HNOSIMP$
 27 SMA1
              HCSTM, MPT, HECPT, HGPCT, DIT/HKGGX, HGPST/C, N, 123/C, N, 123/V, N,
              HNNLK $
 28 SAVE
              HNNLK $
 29 CHKPNT
              HKGGX.HGPST $
 30 SMA2
              HCSTM.MPT, HECPT, HGPCT, DIT/, HBGG/C, N, 1.0/C, N, 123/V.N,
                                                                      HNOBGG=
              -1/C.N.-1 $
 31 SAVE
              HNOBGG $
 32 PURGE
              HBNN. HBFF, HBAA, HBGG/HNOBGG$
 33 CHKPNT
              HBGG. HBNN, HBFF, HBAA $
 33 MATPRN HBGG. . . . // $
 34 LABEL
              HLBL! $
 35
    RMG
              HEST. MATPOOL, HGPTT. HKGGX/HRGG, HQGE, HKGG/C, Y, TABS/C, Y, SIGMA=0.0/
              V.N.HNLR/V.N.HLUSET $
 36 SAVE
              HNLR S
 37 EQUIV
              HKGGX.HKGG/HNLR $
    PURGE
              HRGG, HRNN, HRFF, HRAA, HRDD/HNLR $
 38
 39 CHKPNT
              HRGG.HRNN, HRFF, HRAA, HRDD. HKGG.HQGE $
 40 GP4
              CASECC.GEOM4.HEOEXIN.HSIL.HGPDT/HRG., HUSET./V, N.HLUSET/V, N.
              HMPCF:=-1/V.N.HMPCF2=-1/V.N.HSINGLE=-1/V.N.HOMIT=-1/V.N.HREACT=
              -1/C.N.O/C.N.123/V.N.HNOSET=-1/V.N.HNOL/V.N.HNGA=-1 $
 41 SAVE
              HMPCF: .HSINGLE.HOMIT.HNOSET.HREACT.HMPCF2.HNOL.HNOA $
 42 PURGE
              HGM. HGMD/HMPCF1/HGO. HGOD/HOMIT/HKFS. HPSO. HQP/HSINGLE $
              HKGG, HKNN/HMPCF1/HRGG, HRNN/HMPCF1/HBGG, HBNN/HMPCF1 $
    EOUIV
              HGM. HRG. HGO. HKFS. HQP, HUSET, HGMD, HGOD. HPSO. HKNN, HRNN, HBNN $
 44
     CHKPNT
```

NASTRAN SOURCE PROGRAM COMPILATION DMAP-DMAP INSTRUCTION NO.

- 45 COND HLBL2.HNOSIMP \$
- 46 GPSP HGPL.FGPST.HUSET.HSIL/HOGPST \$
- 47 OFP HOGPST.....//V.N.HCARDNO \$
- 43 SAVE HCARDNO \$
- 49 LABEL HLBL2 \$
- 50 COND HEBLS.HMPCF1 S
- 51 MCE1 HUSET, HRG/HGM \$
- 52 CHKPNT HGM 5
- 53 MCE2 HUSET, HGM, HKGG, HRGG, HBGG, /HKNN, HRNN, HBNN, \$
- 54 CHKPNT HKNN HRNN HENN \$
- 55 LABEL HLBL3 \$
- 56 EOUIV HKNN, HKFF/HSINGLE/HRNN, HRFF/HSINGLE/HBNN, HBFF/HSINGLE \$
- 57 CHKPNT HKFF, HRFF, H8FF \$
- 58 COND HLBL4.HSINGLE \$
- 59 SCE1 HUSET, HKNN, HRNN, HBNN, /HKFF, HKFS, , HRFF, HBFF, \$
- 60 CHKPNT HKFS.HKFF.HRFF.HBFF \$
- 61 LABEL HLBL4 \$
- 62 EQUIV HKFF. HKAA/HOMIT/HRFF, HRAA/HOMIT/HBFF, HBAA/HOMIT \$
- 63 CHKPNT HKAA, HRAA, HBAA \$
- 64 COND HLBL5.HOMIT \$
- 65 SMP1 HUSET.HKFF.../HGO.HKAA..... \$
- 66 CHKPNT HGO, HKAA \$
- 67 COND HLBLR, HNLR \$
- 68 SMP2 HUSET, HGO, HRFF/HRAA \$
- 69 CHKPNT HRAA \$
- 70 LABEL HLBLR \$

NASTRAN SOURCE PROGRAM COMPILATION

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DMAP-DMAP INSTRUCTION
NO.
 71 COND
              HLBL5.HNOBGG $
 72 SMP2
              HUSET. HGO, HEFF/HBAA $
 73 CHKPNT
              HBAA $
 74 LABEL
              HLBL5 $
 75 DPD
              DYNAMICS, HGPL. HSIL, HUSET/HGPLD. HSILD. HUSETD, HTFPOCL, HDLT, ...
              HNLFT.HTRL., HEQDYN/V, N. HLUSET/V, N, HLUSETD/C, N, 123 /V. N. HNODLT/
               C.N.123/C.N.123/V.N.HNONLFT/V.N.HNOTRL/C.N.123/C.N.123/ V.N.
              HNOUE $
 76 SAVE
              # BUONH, TITONH, TICONH, CTBRUHH
 77 COND
              HERROR1.HNOTRLS
 78 EQUIV
              HGO, HGOD/HNCUE/HGM, HGMD/HNOUE $
 79 PURGE
              HPPO.HPSO, HPDO, HPDT/HNODLT $
              HUSETD. HEQDYN, HTFPOOL, HDLT, HTRL, HGOD, HGMD, HNLFT, HSILD, HGPLD,
     CHKPNT
               HPPO, HPSO, HPDO, HPDT $
     MTRXIN
              CASECC.MATPOOL, HEQDYN., HTFPOOL/HK2PP., HB2PP/V.N.HLUSETD/ V.N.
               HNOK2PP/C.N.123/V.N.HNOB2PP $
 82 SAVE
               HNOK2PP, HNOB2PP $
               //C,N,AND/V,N,HKDEKA/V,N,HNOUE/V,N,HNOK2PP $
 83 PARAM
 84
     PURGE
               HK2DD/HNOK2PP/HB2DD/HNOB2PP $
               HKAA, HKDD/HKDEKA/HB2PP, HB2DD/HNOA/HK2PP, HK2DD/HNOA/HRAA, HRDD/
 85 EQUIV
               HNOUE $
 86 CHKPNT
              HK2PP.HB2PP.HK2DD.HB2DD,HKDD.HRDD $
```

HUSET).HGM.HGO.HKAA.HBAA.HRAA.HK2PP.HB2PP/HKDD.HBDD. HRDD. HGMD, HGOD, HK2DD, HM2DD, HB2DD/C, N, TRANRESP/C, N, DISP/C, N, DIRECT/ C,Y,HG=0.0/C,Y,HW3=0.0/C,Y,HW4=0.0/V,N,HN0K2PP/C,N,-1/ V,N. HNOB2PP/V.N.HMPCF1/V.N.HSINGLE/V.N.HOMIT/V.N.HNOUE/ C.N.-1/V.N.

87 COND

88 GKAD

89 LABEL

90 EOUIV

CHKPNT

HLBL5.HNOGPDT \$

HLBL6 \$

HNOBGG/V.N.HNOSIMP/C.N.-1 \$

HKDD, HBDD, HRDD, HGMD, HGOD \$

HK2DD, HKDD/HNOSIMP/HB2DD, HBDD/HNOGPDT \$

NASTRAN SOURCE PROGRAM COMPILATION DMAP-DMAP INSTRUCTION NO. 92 TRLG CASECC. HUSEID. HDLT. HSLT. HBGPDT. HSIL, HCSTM. HTRL, DIT, HGMD, HGOD. HEST/HPPO, HPSO, HPDO, HPDT, , HTOL/V, N, HNOSET/V, N, HPDEPDO \$ 93 SAVE HPDEPDO, HNOSET \$ EQUIV HPPO.HPDO/HNOSET \$ 95 EQUIV HPDO, HPDT/HPDEPDO \$ 95 CHKPNT HPPO. HPDO. HPSO. HTOL, HPDT \$ CASECC. HUSETD. HNLFT, DIT, HGPTT, HKDD, HBDD, HRDD, HPDT, HTRL/HUDVT, 97 TRHT HPNLD/C.Y.BETA=.55/C.Y.TABS=O.O/V.N.HNLR/C.Y.RADLIN=-1 \$ HUDVT, HPNLD \$ 98 CHKPNT CASECC. HEODYN, HUSETD, HUDVT, HTOL, XYCDB, HPNLD/HOUDV1, HOPNL1/ C, 99 VDR N.TRANRESP/C.N.DIRECT/C.N.O/V.N.HNOD/V.N.HNOP/C.N.O \$ 100 SAVE HNOD, HNOP \$ 101 CHKPNT HOUDY . HOPNL1 \$ 102 COND HLBL7.HNOD \$ SDR3 HOUDV: HOPNL1 /HOUDV2.HOPNL2 \$ 103 104 CFP HOUDV2, HOPNL2....//V.N.HCARDNO \$ 105 SAVE HCARDNO \$ CHKPNT HOPNI2.HOUDV2 \$ 106 110 LABEL HLBL7 \$ //C.N.AND/V.N.HPJUMP/V.N.HNOP/V.N.JUMPPLOT \$ PARAM 111 112 COND HLBL9 HPJUMP \$ HUDVT HUPV/HNOA \$ 113 EOUIV 114 COND HLBL3 HNOA \$ 115 SDR1 HUSETD..HUDVT.., HGOD.HGMD.HPSO.HKFS../HUPv..HQP/C.N.1/C.N. TRANSNT \$ 116 LABEL HLBL3 \$ 117 CHKPNT HUPV, HQP \$ 118 PLTTRAN HBGPDT. HSIL/HBGPDP. HSIP/V, N, HLUSET/V, N, HLUSEP \$

NASTRAN SOURCE PROGRAM COMPILATION

```
DMAP-DMAP INSTRUCTION
    NO.
    119 SAVE
                  HLUSEF $
                  CASECC. HCSTM. MPT, DIT, HEQDYN, HSILD, HTOL, HBGPDP, HPPO, HQP, HUPV.
    120 SDR2
                  HEST, AYCDB/HOPP1, HOOP1, HOUPV1, HOES1, HOEF1, HPUGV /C.N.
                  TRANSESP $
    121 SDR3
                  HOPP1.HOOP1.HOUPV1.HOES1.HOEF1./HOPP2.HOOP2.HOUPV2.F7ES2.
                  HOEF2, $
    122 CHKPNT
                  HOPP2.HOOP2.HOUPV2.HOES2.HOEF2 $
    123 OFP
                  HOPP2.HOUPV2.HOEF2.HOES2.//V.N.HCARDNO $
    124 SAVE
                  HCARDNO S
    125
        COND
                  HP2.JUMPPLOT $
    126 PLOT
                  HPLTPAR, HGPSETS, HELSETS, CASECC, HBGPDT, HEQEXIN, HSIP, HPUGV/
                  HPLOTX2/V, N, HNSIL/V, N, HLUSEP/V, N, JUMPPLOT/V, N, HPLTFLG/V, N,
                  HPFI'E $
    127 SAVE
                  HPFILE $
    128 PRTMSG
                  HPLOTA2// 9
    129 LABEL
                  HP2 $
        XYTRAN
                  XYCDB.HOPP2.HOQP2.HOUPV2.HOES2.HOEF2/HXYPLTT/C.N.TRAN/C.N.PSET/
    130
                  V,N,HPFILE/V,N,HCARDNO $
    131
         SAVE
                  HPFILE. HCARDNO $
    132 XYPLOT
                  HXYPLTT// $
    133 LABEL
                  HLBL9 $
    134 JUMP
                  FINIS $
    135 LABEL
                  HERROR1 $
    136 PRTPARM //C,N -1/C,N,HDIRTRD$
    137 LABEL
                  FINISS
    138 END
                  $
*** USER WARNING MESSAGE 54.
     PARAMETER NAMED EPSHT
                             NOT REFERENCED
*** USER WARNING MESSAGE 54.
```

PARAMETER NAMED MAXIT NOT REFERENCED

NO ERRORS FOUND - EXECUTE NASTRAN PROGRAM

-

MATR	IX HBGG	(GINO	NAM	Æ 101)	IS A RE	A L	11 COLUMN X	11 ROW SYMETRIC MATRIX.
COLUMN	1	ROWS	1	THRU	1			•••••
6.064 9 9E	01							
COLUMN	2	ROWS	2	THRU	2		• • • • • • • • • • • • • • • • • • • •	
2.92344E	02							
COLUMN	3	ROWS	3	THRU	3	• • • • • • • • • • • • • • • • • • • •		•••••
1.21300E	02							
COLUMN	4	ROWS	4	THRU	4			•••••
6.06499E	01							
COLUMN	5	ROWS	5	THRU	5			• • • • • • • • • • • • • • • • • • • •
6.06499E	01							
COLUMN	6	ROWS	6	THRU	6			•
2.92844E	02							
COLUMN	7	ROWS	7	THRU	7			
1.21300E	02							
COLUMN	8	ROWS	8	THRU	8			•••••
6.06499E	01							
COLUMN	9	ROWS	9	THRU	9			•••••••••••••••••••••••••••••••
1.71544	02							
COLUMN	10	ROWS	10	THRU	10			
1.71544	02							
COLUMNS	11 TH	RU 1	1 Δ	RE NULL.				
THE NUMBER	OF NON-	ZERO WORD)S 1	N THE LO	NGEST RE	CORD =	2	
THE DENSIT	Y OF THE	S MATRIX	IS	8.26 F	ERCENT.			

^{***} USER INFORMATION MESSAGE FULL INTERNAL SPACE NODE AVAILABLE

^{***} USER INFORMATION MESSAGE . 6 ELEMENTS HAVE A TOTAL VIEW FACTOR (FA/A) LESS THAN 0.99

^{***} USER INFORMATION MESSAGE 3023, B = C =

C = 0 R = 2

^{***} USER INFORMATION MESSAGE 3027, SYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS 0 SECONDS.

*** USER INFORMATION MESSAGE 3027. UNSYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS C SECONDS.

POINT-ID = 1

TIME		TYPE	VALUE	
0.0		S	3.000000E	02
3.0000COE	01	S	2.984949E	02
6.0000COE	01	S	2.959980E	02
6.000000E	02	S	2.777063E	02
1.200000E	03	S	2.749849E	02

POINT-ID = 2

TIME		TYPE	VALUE	
0.0		S	3,000000E	02
3.000000E	01	Ş	2.973813E	02
6.000COOE	01	S	2.927502E	02
6.000000E	02	S	2.549862E	02
1 200000F	03	S	2 494059E	02

POINT-ID =

TIME		TYPE	AYLUE	
0.0		S	3.000000E	02
3.000000E	01	S	2.942329E	02
6.000000E	01	S	2.847380E	02
6.0000001	02	5	2.250109E	02
1.20000GE	03	S	2.168777E	02

POINT-ID = 4

TIME		TYPE	VALUE	
0.0		S	3.000000E	02
3.000000E	01	S	2.939604E	02
6.00000E	01	S	2.836946E	02
6.000000E	02	S	2.160496E	02
1.200000E	03	S	2.069669E	02

POINT-ID = 5

TIME		TYPE	VALUE	
0.0		S	3.000000E	02
3.000000E	01	S	2.984951E	02
6.00000CE	01	S	2.959953E	02
6.000000E	02	S	2.777063E	02
1.200000E	03	S	2.749849E	02

POINT-ID = 6

TIME		TYPE	VALUE	
0.0		S	3.0C0000E	02
3.000000E	01	S	2.973813E	02
6.000000E	01	S	2.927502E	02
6.000000E	02	S	2.549862E	02
1.200000E	03	S	2.494059E	02

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TIME		TYPE	VALUE	
0.0		S	3.000000E	02
3.00000CE	01	S	2.942332E	02
6.000000E	01	S	2.847383E	02
6.000000E	02	S	2.250110E	02
1.200000E	03	S	2.168777E	02

POINT-ID = 8

TIME		TYPE	VALUE	
0.0		Ş	3.00000E	02
3.000000E	01	S	2.939607E	02
3000000E	01	S	2.836948E	02
6.000000E	02	S	2.160497E	02
1.200000E	ΟЗ	S	2.069669E	02

POINT-ID 100

TIME		TYPE	VALUE	
0.0		S	3.000000E	02
3.000000E	01	S	2.999993E	02
6.000000E	01	S	2.999995E	02
6.000000E	02	S	2.99993E	02
1.200000E	03	S	2 999980F	02

ELEMENT-ID = 10
FINITE ELEMENT TEMPERATURE GRADIENTS AND HEAT FLOWS

TIME	EL-TYPE	X-GRADIENT	Y-GRADIENT	Z-GRADIENT	X-FLOW	Y-FLOW	Z-FLOW
0.0	ROD	0.0			0.0		
3.000000E 01	ROD	-1.113525E 00			2.227051E 02		
6.000000E 01	ROD	-3.247803E 00			6.495605E 02		
6.000000E J2	ROD	-2.272011E 01			4.544020E 03		
1.200000E 03	ROD	-2.557899E 01			5.115797E 03		

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ELEMENT-ID = 20
FINITE ELEMENT TEMPERATURE GRADIENTS AND HEAT FLOWS

TIME	EL-TYPE	X-GRADIENT	Y-GRADIENT	Z-GRADIENT	X-FLOW	Y-FLOW	Z-FLOW
0.0	ROD	0.0			0.0		
3.00000CE 01	ROD	-1.113770E 00			2.227539E 02		
6.000000E 01	ROD	-3.248047E 00			6.496094E 02		
6.000000E 02	ROD	-2.272011E 01			4.544020E 03		
1.2000CCE 03	ROD	-2.557898E 01			5.115793E 03		

ELEMENT-ID = 30
FINITE ELEMENT TEMPERATURE GRADIENTS AND HEAT FLOWS

TIME	EL-TYPE	X-GRADIENT	Y-GRADIENT	Z-GRADIENT	X-FLOW	Y-FLOW	Z-FLOW
0.0	QUAD2	0.0	0.0		0.0	0.0	
3.00000CE 01	QUAD2	-1.113647E 01	1.220703E-03		2.227295E 03	-2.441406E-01	
6.000000E 01	QUAD2	-3.247925E 01	1.220703E-03		6.495848E 03	-2.441406E-01	
6.000000E 02	QUAD2	-2.272012E 02	0.0		4.544023E 04	0.0	
1.200000E 03	QUAD2	-2.557900E 02	0.0		5.115801E 04	0.0	

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ELEMENT-ID = 40
FINITE ELEMENT TEMPERATURE GRADIENTS AND HEAT FLOWS

TIME	EL-TYPE	X-GRADIENT	Y-GRADIENT	Z-GRADIENT	X-FLOW	Y-FLOW	Z-FLOW
0.0	QUAD2	0.0	0.0		0.0	0.0	
3.00000CE 01	QUAD2	-3.148315E 01	1.220703E-03		6.296629£ 03	-2.441406E-01	
6.000000E 01	QUAD2	-8.012085E 01	1.220703E-03		1.602417E 04	-2.441406E- 0 1	
6.000000E 02	QUAD2	-2.997527E 02	4.882813E-04		5.995054E 04	-9.765625E-02	
1.200000E 03	QUAD2	-3.252820E 02	0.0	,	6.505639E 04	0.0	

ELEMENT-ID = 50
FINITE ELEMENT TEMPERATURE GRADIENTS AND HEAT FLOWS

TIME	EL-TYPE	X-GRADIENT	Y-GRADIENT	Z-GRADIENT	X-FLOW	Y-FLOW	Z-FLOW
0.0	QUAD2	0.0	0.0		0.0	0.0	
3.000000E 01	QUAD2	-2.724609E 00	2.441406E-03		5.449219E 02	-4.882813E-01	
6.000000E 01	QUAD2	-1.043457E 01	2.441405E-03		2.086914E 03	-4.882813E-01	
6.000000E 02	QUAD2	-8.961304E 01	7.324219E-04		1.792261E 04	-1.464844E-01	
1.200000E 03	QUAD2	-9.910791E 01	0.0		1.982158E 04	0.0	



ELEMENT-ID = 60 FINITE ELEMENT TEMPERATURE GRADIENTS AND HEAT FLOWS

TIME	EL-TYPE	X-GRADIENT	Y-GRADIENT	Z-GRADIENT	X-FLOW	Y-FLOW	Z-FLOW
0.0	HBDY	0.0			0.0		
3.000000E 01	HBDY	-1.504395E 00			9.447591E 00		
6.000000E 01	HBDY	-4.001465E 00			2.512918E 01		
6.00000CE 02	HBDY	-2.229199E 01			1.399936E 02		
1.200000E 03	HBCY	-2.501318E 01			1.570827E 02		

ELEMENT-ID = 2CO FINITE ELEMENT TEMPERATURE GRADIENTS AND HEAT FLOWS

TIME	EL-TYPE.	X-GRADIENT	Y-GRADIENT	Z-GRADIENT	X-FLOW	Y-FLOW	Z-FLOW
0.0	∺ B © Y	0.0			0.0		2
3.000000E 01	HBDY	0.0			0.0		
6.000000E 01	нвоч	0.0		1	0.0		
6.000000E 02	HBDY	0.0			0.0		
1.200000E 03	HBDY	0.0			0.0		

ELEMENT-ID = 300 FINITE ELEMENT TEMPERATURE GRADIENTS AND HEAT FLOWS

TIME	EL-TYPE	X-GRADIENT	Y-GRADIENT	Z-GRADIENT	X-FLOW	Y-FLOW	Z-FLOW
0.0	HBÒY	0.0			0.0		
3.000000E 01	HBDY	0.0			0.0		•
6.000000E 01	HBDY	0.0			0.0		
6.000000E 02	HBDY	0.0			0.0		
1.200000E 03	HBDY	0.0		•	0.0		
	•						

ELEMENT-ID = 400 FINITE ELEMENT TEMPERATURE GRADIENTS AND HEAT FLOWS

TIME	EL-TYPE	X-GRADIENT	Y-GRADIENT	Z-GRADIENT	X-FLOW	Y-FLOW	Z-FLOW
0.0	HBDY	0.0			6.0		
3.000000E 01	HBDY	0.0			0.0		
6.000000E 01	HBDY	0.0			0.0		
6.000000E 02	HBDY	0.0			0.0		
1.200000E 03	HBDY	0.0			0.0		

ELEMENT-ID = 500 FINITE ELEMENT TEMPERATURE GRADIENTS AND HEAT FLOWS

TIME	EL-TYPE	X-GRADIENT	Y-GRADIENT	Z-GRADIENT	X-FLOW	Y-FLOW	Z-FLOW
0.0	HBDY	0.0			0.0		
3.000000E 01	HBDY	0.0			0.0		
6.00000CE 01	HBDY	0.0			0.0		
6.000000E 02	HBDY	0.0			0.0		
1.200000E 03	HBDY	0.0			0.0		

ELEMENT-ID = 600
FINITE ELEMENT TEMPERATURE GRADIENTS AND HEAT FLOWS

TIME	EL-TYPE	X-GRADIENT	Y-GRADIENT	Z-GRADIENT	X-FLOW	Y-FLOW	Z-FLOW
0.0	HBDY	0.0			0.0		
3.000000E 01	HBDY	0.0 .			0.0		
6.000000E 01	HBDY	0.0			0.0		
6.000000E 02	HBDY	0.0			0.0		
1.200000E 03	HBDY	0. 0			0.0		

ELEMENT-ID = 700
FINITE ELEMENT TEMPERATURE GRADIENTS AND HEAT FLOWS

TIME	EL-TYPE	X-GRADIENT	Y-GRADIENT	Z-GRADI ENT	X-FLOW	Y-FLOW	Z-FLOW
0.0	HBDY	0.0			0.0		
3.000000E 01	HBDY	0.0			0.0		
6.000000E 01	HBDY	0.0			0.0		
6.000000E 02	HBDY	0.0		•	0.0		
1.200000E 03	нвру	0.0			0.0		

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......
     NASTRAN LOADED AT LOCATION 1F2F20
TIME TO GO = 59 CPU SEC., 298 I/O SEC.
     O CPU-SEC.
                     O ELAPSED-SEC.
                                      SEM1
                                            BEGN
     O CPU-SEC.
                     O ELAPSED-SEC.
                                      SEMT
     1 CPU-SEC.
                                      NAST
                     2 ELAPSED-SEC.
     1 CPU-SEC.
                     2 ELAPSED-SEC.
                                      GNFI
                                      XCSA
     1 CPU-SEC.
                     3 E-LAPSED-SEC
     1 CPU-SEC.
                     4 TLAPSED-SEC.
                                      IFP1
     1 CPU-SEC.
                     7 ELAPSED-SEC.
                                      XSOR
     2 CPU-SEC.
                    11 ELAPSED-SEC.
                                        DO
                                           IFP
     2 CPU-SEC.
                    26 ELAPSED-SEC.
                                       END
                                            IFP
     2 CPU-SEC.
                    26 ELAPSED-SEC.
                                      XGPI
     4 CPU-SEC.
                    31 ELAPSED-SEC.
                                      SEM1
                                           END
                                            LINKNSO2 ---
     4 CPU-SEC.
                    31 ELAPSED-SEC
    23 I/O SEC.
LAST LINK DID NOT USE
                      40016 BYTES OF OPEN CORE
     4 CPU-SEC.
                    33 ELAPSED-SEC.
                                            LINK END ---
     4 CPU-SEC.
                    33 ELAPSED-SEC.
                                      XSFA
     5 CPU-SEC
                    34 ELAPSED-SEC.
                                      XSFA
                                            GP1
                                                   BEGN
     5 CPU-SEC
                    34 ELAPSED-SEC.
                                      3
                                            GP1
     5 CPU-SEC.
                    39 ELAPSED-SEC.
                                      3
                                                   END
     5 CPU-SEC.
                    42 ELAPSED-SEC.
                                      8
                                            GP2
                                                   BEGN
                                            GP2
                                                   END
     5 CPU-SEC.
                    42 ELAPSED-SEC.
                                      8
     5 CPU-SEC.
                    42 ELAPSED-SEC.
                                      10
                                            PLTSET
                                                   BEGN
     5 CPU-SEC.
                    43 ELAPSED-SEC.
                                      10
                                            PLTSET
                                                   END
                                            PRIMSG
                                                   BEGN
     5 CPU-SEC.
                    44 ELAPSED-SEC.
                                      12
     5 CPU-SEC.
                    44 ELAPSED-SEC.
                                      12
                                            PRTMSG
                                                   END
     5 CPU-SEC.
                    44 ELAPSED-SEC.
                                      13
                                            SETVAL
                                                   BEGN
     5 CPU-SEC.
                    44 ELAPSED-SEC.
                                      13
                                            SETVAL
                                                   END
     5 CPU-SEC.
                    45 ELAPSED-SEC.
                                      21
                                            GP3
                                                   BEGN
                                                   END
     5 CPU-SEC.
                                            GP3
                    54 ELAPSED-SEC.
                                      21
                                                   BEGN
     5 CPU-SEC.
                    55 ELAPSED-SEC.
                                      23
                                            TA1
     5 CPU-SEC.
                    64 ELAPSED-SEC.
                                      23
                                            TA1
                                                   END
     5 CPU-SEC.
                    64 ELAPSED-SEC.
                                            LINKNSO3 ---
    54 I/O SEC.
                      82788 BYTES OF OPEN CORE
LAST LINK DID NOT USE
                    68 ELAPSED-SEC.
                                           LINK END ---
     5 CPU-SEC.
                                            SMA1
                                                   BEGN
     5 CPU-SEC
                    68 ELAPSED-SEC.
                                      27
     6 CPU-SEC.
                    72 ELAPSED-SEC.
                                      27
                                            SMA1
                                                   END
     6 CPU-SEC.
                    "3 ELAPSED-SEC.
                                       30
                                            SMA2
                                                   BEGN
     6 CPU-SEC.
                    "6 ELAPSED-SEC.
                                            SMA2
                                                   END
                    78 ELAPSED-SEC.
                                            LINKNSO8 ---
     6 CPU-SEC.
    62 I/O SEC.
                      64268 BYTES OF OPEN CORE
LAST LINK DID NOT USE
                                           LINK END ---
                    81 ELAPSED-SEC.
     6 CPU-SEC.
                                            MATPRN BEGN
     6 CPU-SEC.
                    81 ELAPSED-SEC.
                                       33
     6 CPU-SEC.
                    82 ELAPSED-SEC.
                                       33
                                            MATPRN END
                    82 ELAPSED-SEC.
     6 CPU-SEC.
                                            LINKNSO5 ---
    65 I/O SEC.
LAST LINK DID NOT USE 136144 BYTES OF OPEN CORE
     6 CPU-SEC.
                    35 ELAPSED-SEC.
                                      ----
                                           LINK END ---
     6 CPU-SEC.
                    85 ELAPSED-SEC.
                                       35
                                            RMG
                                                   BEGN
     6. CPU-SEC.
                    88 ELAPSED-SEC.
                                       SDCO
                                            MP
                                       SDCO
                                           MP
     6 CPU-SEC.
                    88 ELAPSED-SEC.
                                       FBS
     6 CPU-SEC.
                    89' ELAPSED-SEC.
     6 CRU-SEC.
                    90 ELAPSED-SEC.
                                       FBS
```

```
6 CPU-SEC.
                                          MPYA D
                      91 ELAPSED-SEC.
                                                                                               0.0
                                                METHOD 2 NT.NBR PASSES = 1.EST. TIME =
    6 CPU-SEC.
                      92 ELAPSED-SEC.
                                          MPYA
                                                D
                                                POSE
    6 CPU-SEC.
                      92 ELAPSED-SEC.
                                          TRAN
                      93 ELAPSED-SEC.
                                          TRAN POSE
     6 CPU-SEC.
                                          MPYA D
     6 CPU-SEC.
                      93 ELAPSED-SEC.
                                                METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                0.0
     7 CPU-SEC.
                      94 ELAPSED-SEC.
                                          MPYA D
     7 CPU-SEC.
                      E7 ELAPSED-SEC.
                                          35
                                                 RMG
                                                         END
                                           ---- LINKNS04 ---
     7 CPU-SEC.
                      EB ELAPSED-SEC.
    8: I/O SEC.
LAST LINK DID NOT USE 72520 BYTES OF OPEN CORE
                                          ---- LINK END ---
     7 CPU-SEC.
                     103 ELAPSED-SEC.
     7 CPU-SEC.
                     103 ELAPSED-SEC.
                                           40
                                                 GP4
                                                         BEGN
     7 CPU-SEC.
                     107 ELAPSED-SEC.
                                           40
                                                 GP4
                                                         END
     7 CPU-SEC.
                     108 ELAPSED-SEC.
                                           46
                                                 GPSP
                                                         BEGN
                                                GPSP
                                                         END
     7 CPU-SEC.
                     109 ELAPSED-SEC.
                                           46
                                           ---- LINKNS14 ---
     7 CPU-SEC.
                     110 ELAPSED-SEC.
    89 I/O SEC.
LAST LINK DID NOT USE 117044 BYTES OF OPEN CORE
                                           ---- LINK END ---
     7 CPU-SEC.
                     114 ELAPSED-SEC.
                     114 ELAPSED-SEC.
     7 CPU-SEC.
                                           47
                                                 OFP
                                                         BEGN
                                           47
                                                 OFP
                                                         END
     7 CPU-SEC.
                     114 ELAPSED-SEC.
                                           ---- LINKNS04 ---
     7 CPU-SEC.
                     119 ELAPSED-SEC.
    93 I/O SEC.
LAST LINK DID NOT USE 115664 BYTES OF OPEN CORE
                                           ---- LINK END ---
     7 CPU-SEC.
                     136 ELAPSED-SEC.
     8 CPU-SEC.
                     136 ELAPSED-SEC.
                                           51
                                                 MCE1
                                                         BEGN
     B CPU-SEC.
                     138 ELAPSED-SEC.
                                           51
                                                 MCE1
                                                         END
                                                 MCE2
                                                         BEGN
     B CPU-SEC.
                     139 ELAPSED-SEC.
                                           53
                                           MPYA D
     8 CPU-SEC.
                     141 ELAPSED-SEC.
                                                 METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                0.0
     8 CPU-SEC.
                     143 ELAPSED-SEC.
                                           MPYA
                     143 ELAPSED-SEC.
                                           MPYA D
     8 CPU-SEC.
                                                 METHOD 2 T .NBR PASSFS =
                                                                            1,EST. TIME =
                                                                                                0.0
                                           MPYA D
     8 CPU-SEC.
                     144 ELAPSED-SEC.
     8 CPU-SEC.
                     144 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 T ,NBR PASSES =
                                                                            1.EST. TIME =
                                                                                                0.0
     8 CPU-SEC.
                     145 ELAPSED-SEC.
                                           MPYA D
     9 CPU-SEC.
                      147 ELAPSED-SEC.
                                           MPYA
                                                ח
                                                 METHOD 2 NT.NBR PASSES = 1,EST. TIME =
                                                                                                0.0
     9 CPU-SEC.
                      155 ELAPSED-SEC.
                                           MPYA
                                                D
     9 CPU-SEC.
                      158 ELAPSED-SEC.
                                           AYAM
                                                 METHOD 2 T ,NBR PASSES =
                                                                            1,EST. TIME =
                                                                                                0.0
     9 CPU-SEC.
                      159 ELAPSED-SEC.
                                           MPYA D
                                           MPYA
     9 CPU-SEC.
                      159 ELAPSED-SEC.
                                                D
                                                 METHOD 2 T .NBR PASSES =
                                                                            1.EST. TIME =
                                                                                                0.0
                      131 ELAPSED-SEC.
                                           MPYA D
    10 CPU-SEC.
    10 CPU-SEC.
                      163 ELAPSED-SEC.
                                           MPYA
                                                 METHOD 2 NT.NBR PASSES =
                                                                            1.EST. TIME =
                                                                                                0.0
                      165 ELAPSED-SEC.
                                           MPYA D
    10 CPU-SEC.
    10 CPU-SEC.
                      165 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                                0.0
    10 CPU-SEC.
                      136 ELAPSED-SEC.
                                           MPYA D
    10 CPU-SEC.
                      136 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 T .NBR PASSES = 1.EST. TIME =
                                                                                                0.0
    11 CPU-SEC.
                      167 ELAPSED-SEC.
                                           MPYA D
                                           53
                                                 MCE2
                                                         END
    11 CPU-SEC.
                      167 ELAPSED-SEC.
    11 CPU-SEC.
                      169 ELAPSED-SEC.
                                           XSFA
    11 CPU-SEC.
                      171 ELAPSED-SEC.
                                           XSFA
                                                LINKNSO6 ---
    11 CPU-SEC.
                      171 ELAPSED-SEC.
   115 I/O SEC.
LAST LINK DID NOT USE 102132 BYTES OF OPEN CORE
                                          ---- LINK END ---
    11 CPU-SEC.
                     173 ELAPSED-SEC.
```

```
11 CPU-SEC.
                     173 ELAPSED-SEC.
                                           75
                                                 DPD
                                                         BEGN
    11 CPU-SEC.
                     178 ELAPSED-SEC.
                                           75
                                                 DPD
                                                         END
                     180 ELAPSED-SEC.
                                           ---- LINKNS10 ---
    11 CPU-SEC.
   124 I/O SEC.
LAST LINK DID NOT USE 116416 BYTES OF OPEN CORE
    11 CPU-SEC.
                     183 ELAPSED-SEC.
                                           ---- LINK END ---
                                           81
                                                 MTRXIN BEGN
    11 CPU-SEC.
                     183 ELAPSED-SEC.
    11 CPU-SEC.
                     184 ELAPSED-SEC.
                                           81
                                                 MTRXIN
                                                        END
                                                 PARAM
                                                         BEGN
                     184 ELAPSED-SEC.
                                           83
    11 CPU-SEC.
                                           83
                                                 PARAM
                                                         END
    11 CPU-SEC.
                     184 ELAPSED-SEC.
    11 CPU-SEC.
                     18:5 ELAPSED-SEC.
                                           XSFA
    12 CPU-SEC.
                     167 ELAPSED-SEC.
                                           XSFA
                                                 GKAD
                                                         BEGN
    12 CPU-SEC.
                     187 ELAPSED-SEC.
                                           88
    12 CPU-SEC.
                     189 ELAPSED-SEC.
                                           88
                                                 GKAD
                                                         END
    12 CPU-SEC.
                     190 ELAPSED-SEC.
                                           <u>- - - -</u>
                                                 LINKNSO5 ---
   130 I/O SEC.
LAST LINK DID NOT USE 117064 BYTES OF OPEN CORE
                                           ---- LINK END ---
    12 CPU-SEC.
                     192 ELAPSED-SEC.
                                                 TRLG
                                                         BEGN
    12 CPU-SEC.
                     192 ELAPSED-SEC.
                                           92
                                           MPYA D
    12 CPU-SEC.
                     200 ELAPSED-SEC.
                                                                                                 0.0
                                                 METHOD 2 T .NBR PASSES =
                                                                             1,EST. TIME =
                                           MPYA D
    12 CPU-SEC.
                      201 ELAPSED-SEC.
    12 CPU-SEC.
                     203 ELAPSED-SEC.
                                           MPYA D
                                                                                                 0.0
                                                 METHOD 2 NT.NBR PASSES =
                                                                            1.EST. TIME =
    12 CPU-SEC.
                     203 ELAPSED-SEC
                                           MPYA D
    12 CPU-SEC.
                      204 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 NT.NBR PASSES =
                                                                             1.EST. TIME =
                                                                                                 0.0
    13 CPU-SEC.
                     205 ELAPSED-SEC.
                                           MPYA D
    13 CPU-SEC.
                     205 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                 0.0
    13 CPU-SEC.
                      205 FLAPSED-SEC.
                                           MPYA D
                                                         END
    13 CPU-SEC.
                      206 ELAPSED-SEC.
                                           92
                                                 TRLG
                                                 LINKNS11 - · -
                      206 ELAPSED-SEC.
    13 CPU-SEC.
   145 I/O SEC.
LAST LINK DID NOT USE 58172 BYTES OF OPEN CORE
                                           ---- LINK END ---
    13 CPU-SEC.
                     210 ELAPSED-SEC.
    13 CPU-SEC.
                                                 TRHT
                      210 ELAPSED-SEC.
                                           97
                                                          BEGN
                                           DECO MP
    13 CPU-SEC.
                      214 ELAPSED-SEC.
                                           DECO MP
    13 CPU-SEC.
                      215 ELAPSED-SEC.
    15 CPU-SEC.
                      283 ELAPSED-SEC.
                                           97
                                                 TRHT
                                                          END
                      283 ELAPSED-SEC.
                                           ---- LINKNS12 ---
    15 CPU-SEC.
   205 I/O SEC.
LAST LINK DID NOT USE 69268 BYTES OF OPEN CORE
                                           ---- LINK END ---
    16 CPU-SEC.
                      293 ELAPSED-SEC.
    16 CPU-SEC.
                      293 ELAPSED-SEC.
                                           99
                                                 VDR
                                                          BEGN
    16 CPU-SEC.
                      300 ELAPSED-SEC.
                                                 VDR
                                                          END
                                           99
                                                 PARAM
                                                          BEGN
    16 CPU-SEC.
                      300 ELAPSED-SEC.
                                           111
    16 CPU-SEC.
                      300 ELAPSED-SEC.
                                           111
                                                 PARAM
                                                          END
                                           XSFA
                      302 ELAPSED-SEC.
    16 CPU-SEC.
    16 CPU-SEC.
                      303 ELAPSED-SEC.
                                           XSFA
    16 CPU-SEC.
                      303 ELAPSED-SEC.
                                           115
                                                 SDR1
                                                          BEGN
    16 CPU-SEC.
                      303 ELAPSED-SEC.
                                           MPYA D
                                                 METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                 0.1
    16 CPU-SEC.
                      305 ELAPSED-SEC.
                                           MPYA
                                                 D
    17 CPU-SEC.
                      310 ELAPSED-SEC.
                                           115
                                                 SDR1
                                                          END
                      310 ELAPSED-SEC.
                                                 LINKNSO8 ---
    17 CPU-SEC.
   216 I/O SEC.
LAST LINK DID NOT USE 119096 BYTES OF OPEN CORE
                                           ---- LINK END ---
    17 CPU-SEC.
                      316 ELAPSED-SEC.
    17 CPU-SEC.
                      316 ELAPSED-SEC.
                                           118
                                                 PLTTRAN BEGN
                                           118
                                                 PLTTRAN END
    17 CPU-SEC.
                      317 ELAPSED-SEC.
                                                 LINKNS13 ---
    17 CPU-SEC.
                      318 ELAPSED-SEC.
   219 I/O 5EC.
LAST LINK DID NOT USE 114512 BYTES OF OPEN CORE
```

```
17 CPU-SEC.
                     323 ELAPSED-SEC.
                                          ---- LINK END ---
    -17 CPU-SEC.
                     323 ELAPSED-SEC.
                                         120
                                               SDR2
                                                       BEGN
    17 CPU-SEC.
                     332 ELAPSED-SEC.
                                         120
                                               SDR2
                                                       END
    17 CPU-SEC.
                     332 ELAPSED-SEC.
                                          ---- LINKNS14 ---
   227 1/0 SEC.
LAST LINK DID NOT USE 66424 BYTES OF OPEN CORE
    17 CPU-SEC.
                     338 ELAPSED-SEC.
                                         ---- LINK END ---
    17 CPU-SEC.
                     338 ELAPSED-SEC.
                                          121
                                               SDR3
                                                      BEGN
    18 CPU-SEC.
                     348 ELAPSED-SEC.
                                               SDR3
                                                        END
                                         121
    18 CPU-SEC.
                     348 ELAFSED-SEC.
                                         123
                                                OFP
                                                        BEGN
    18 CPU-SEC.
                     3EO ELAPSED-SEC.
                                         123
                                               OFP
                                                        END
    18 CPU-SEC.
                     351 ELAPSED-SEC.
                                          130
                                               XYTRAN BEGN
    18 CPU-SEC.
                     351 ELAPSED-SEC.
                                          130
                                               XYTRAN END
    18 CPU-SEC.
                     351 ELAPSED-SEC.
                                          ---- LINKNSO2 ---
   239 I/O SEC.
LAST LINK DID NOT USE 12720 BYTES OF OPEN CORE
    18 CPU-SEC.
                     362 ELAPSED-SEC.
                                         ---- LINK END ---
    18 CPU-SEC.
                     362 ELAPSED-SEC.
                                          132
                                                XYPLOT BEGN
    18 CPU-SEC.
                     363 ELAPSED-SEC.
                                          132
                                                XYPLOT END
    18 CPU-SEC.
                     363 ELAPSED-SEC.
                                          138
                                                EXIT
                                                        BEGN
= 241 I/O SEC.
```

LAST LINK DID NOT USE 97232 BYTES OF OPEN CORE AMOUNT OF OPEN CORE NOT USED = 12K BYTES

MEMMINIAN MARKATAN MA DESCRIPTION OF THE PROPERTY OF

MINIMAN MARIAM MARIAMAN MANAGEM MANAGEM MARIAMAN

SOMEON AND SOMEON AND AND ADDRESS OF A SOMEON ADDRESS OF A SOMEON AND ADDRESS OF A SOMEON AND ADDRESS OF A SOMEON AND ADDRESS OF A SOMEON AND ADDRESS OF A SOMEON AND ADDRESS OF A SOMEON AND ADDRESS OF A SOMEON AND ADDRESS OF A SOMEON AND ADDRESS OF A SOMEON AND ADDRESS OF A SOMEON AND ADDRESS OF A SOMEON ADDRESS OF A SOMEON AND ADDRESS OF A SOMEON мения примения выпражения примения примения по примения п

MWMWMMMMWMM MINIMAN MARKATAN MARK

MRINDERCHAMINE MARTINEMENT MARTINEMENT MARTINES MUMANDAMINA BLACKMERSAMMINAMMAN MINAMMANAMMAN MARAMMAN BLACKMERSAMMAN /////

MMMMADMAN MARAMAN MARA

MEGITATION OF THE PROPERTY OF MMMMMMMM MMMMMMMMM MMMMMM MMMMM /NiM --MMMMMM /// M MM--MMM

MARCMANALAISE MMMMMM MMMSIMMM MMMMMM/// MMM MMM M MMMMMMMM MMMMM M MMRMMG 1/1///// MICCAM MM - - MPANNAM MANNAMM MMM MMM MMM MMMMM MMMMMMMMM М MMM MMMM// /// ////mwm asmism - - mmismamm MMMANION MMM М MMM MMMMMMMMM MW MIM 1111 111 MAMMAMAM - - - M MAMMAMM Management M MMM MM MMMM MM MMMMMMMMMMM MMMM / /// ///MM MMMMMMMM - - - M MMMMMM MMRGMMMM MMMMMM М MMMM MM MANAMAMAMAM MEMBERSHIP 11111 // # MMMINM - - - MMMM MMARKAM M MMM MMMMMMMMMM MM MMMMMIT MMMMMMM MAKE MMMMMMM MM MMMM MM/////// MMM - - - - MMMM M MMMM M MMM MM

////MMMMMM MARAMASSI M. M. MARAMASSI MIMMAN - - - - M MMIA IAM MEDIANA MARMINGALIA MARAMANA MARAMMINI MARAMANA MARAMANA --- MARAMANA MARAM MIMMEDIAMATATIFE TOMANDANIA MARANDANIA MARANDAN MANAGEMENT MANAGEMENT WAS A STATE OF THE STA

MMMMMMAMMAMMMMMMMMMMM - - MMMMMMM MMMMORE FOR THE MARKEMENT AND A SECOND TO THE SECOND TO TH MMMAN AVMUMENTAL MASAMISMIMMAMMAMMAMMASSIVM

MMPAMMISSON MAMPHADE - NASANTANGARAMMANASAKAN MAMPANASAKAN
MININESTRANSACIONEM GARMANAMINA MAGESTES AND ANTIGORIA (ANTIGORIA - ANTIGORIA (ANTIGORIA ANTIGORIA ANTIGOR

ММИМОВИЯМИ - - МИМОВИЛЬНОВИМОВИМОМИМОМИВИВИТЕЛЬНИМИ MMMMMMMMMM

MM--MODERAMMINIAMEN MINIMEDIA MANAGEMENTA ММККАМИМИ ТАК ВИМЕНИМИЗАКИМЕНИМИЗИМИ ВИКИМОМОМОВИМИМИМИМИ

MINITERMANDEMENTATION OF THE PROPERTY OF THE PR

IBM 360-370 SERIES MODELS 91,95

RIGID FORMAT SERIES M

LEVEL 15.5.3

MMMM MMMM MMMMM

MMMM MMMM MIV MM MMMM MM MM MMMM MM MMMMMMM

MMMMM MMMM MM MMMM MMMMMM MMMM

MMM

/////

SYSTEM GENERATION DATE - 12/31/74

NASTRAN EXECUTIVE CONTROL DECK ECHO

CASE CONTROL DECK ECHO

CARD	
COUNT	
1	5
2	\$\darkarrandarrandarrandarrandarrandarrandarrandarrandarrandarrandarrandarrandarrandarrandarrandarrandarrandarr
3	\$ END OF EXECUTIVE CONTROL START CASE CONTROL ***********************
4	\$*x***********************************
5	\$ [']
6	TITLE= FINITE DIFFERENCE USE OF THE NASTRAN THERMAL ANALYZER
7	LINE=51
8	ECHO=BOTH
9 .	IC=100
10	TEMP(MATERIAL)=101
11	TSTEP=500
12	OUTPUT
13	THERMAL=ALL
14	\$
15	\$*************************************
16	\$ END CASE CONTROL START BULK DATA ******************************
17	\$#####################################
18	\$
19	BEGIN BULK

```
INPUT BULK DATA DECK ECHO
```

```
1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 .
$ UNITS USED ARE METERS, WATTS, AND DEGREES CELSIUS
$
$
$ NOTE THAT NO LOCATION IS SPECIFIED
GRID
GRID
$ APPLY THERMAL MASS TO GRID POINTS ONE AND TWO
S THE TEMPERATURE OF GRID POINT 1 IS EFFECTIVELY FIXED DUE TO ITS
$ LARGE THERMAL MASS.
$ GRID POINT 2 POSSESSES A THERMAL MASS OF 100 JOULES PER DEGREE CELSIUS.
CDAMP2 300
             1.E+8 1
CDAMP2 301
             1000. 2
$ CONDUCTIVELY COUPLE GRID POINTS ONE AND TWO
$ THE COUPLING WILL BE 5 WATTS PER DEGREE CELSIUS
CELAS2 400
             5
                  1 1
S THE FOLLOWING CARDS HAVE BEEN PREVIOUSLY DISCUSSED
CHBDY
      200
             201
                    POINT 2
PHBDY
      201
                    10.
                           .6
RADLST 200
RADMTX 1
PARAM
      SIGMA
            5.685E-8
      TABS
PARAM
             273.15
TEMP
       100
                    Ο.
                                  300.
             1
                                  -50.
TEMP
       101
                    0.
TSTEP
      500
             45
$
ENDDATA
```

"OTAL COUNT= 39

*** USER INFORMATION MESSAGE 207, BULK DATA NOT SORTED, XSORT WILL RE-ORDER DECK.

			s d	RTE	D B	ULK	DATA	4 ЕСН	0		
CARD											
COUNT	. 1	2	3	4		5	6	7	8	9	10 .
1 -	CDAMP2	300	1.E+8	1	1						
2-	CDAMP2	301	1000.	2	1						
3-	CELAS2	400	5.	1	1	2	1				
4-	CHBDY	200	201	POINT	2						
5-	GRID	1									
6-	GRID	2									
7 -	PARAM	SIGMA	5.685E-	· 8							
8-	PARAM	TABS	273.15								
9-	PHBDY	201		10.	. 6						
10-	RADLST	200									
11-	RADMIX	1	6.								
12-	TEMP	100	1	0.0	2	300					
13-	TEMP	101	1	0.0	2	- 50					
14-	TSTEP	500	45	. 1	1						
	ATAGGNE										

NO ERRORS FOUND - EXECUTE NASTRAN PROGRAM

*** USER INFORMATION MESSAGE FULL INTERNAL SPACE NODE AVAILABLE

*** USER INFORMATION MESSAGE 1 ELEMENTS HAVE A TOTAL VIEW FACTOR (FA/A) LESS THAN 0.99

TIME	TYPE	VALUE
0.0	S	0.0
9.999996E-02	S	8.218437E-07
1.999999E-01	s	2.310435E-06
2.999999E-01	s	3.788811E-06
3.999999E-01	s	5.257123E-06
4.993998E-01	s	6.715506E-06
5.999998E-01	s	8.164096E-06
6.999997E-01	s	9.603024E-06
7.999997E-01	S	1.103241E-05
8.999997E-01	S	1.245239E-05
9.999996E-01	S	1.386307E-05
1.099999E 00 1.199999E 00 1.29999BE 00	s s	1.526458E-05 1.665702E-05 1.804052E-05
1.399998E 00	S	1.941517E-05
1.499997E 00	S	2.078110E-05
1.599997E 00	S	2.213840E-05
1.699996E 00	S	2.348718E-05
1.799995E 00	S	2.482755E-05
1.699995E 00	S	2.615960E-05
1.999994E 00 2.099994E 00 2.199993E 00	S S	2.748343E-05 2.879913E-05 3.010679E-05
2.299993E 00	\$	3.140653E-05
2.399992E 00	\$	3.269840E-05
2.499991E 00	5	3.398251E-05
2.593991E 00	\$	3.525894E-05
2.699990E 00	\$	3.652778E-05
2.799990E 00	\$	3.778913E-05
2.899989E 00	\$	3.904304E-05
2.999989E 00	5	4.028960E-05
3.099988E 00	S	4.152890E-05
3.199987E 00	S	4.276101E-05
3.299987E 00	\$	4.398599E-05
3.399986E 00	\$	4.520392E-05
3.499986E 00	\$	4.641491E-05
3.599985E 00	S	4.761899E-05
3.699985E 00	S	4.881625E-05
3.799984E 00	S	5.000674E-05
3.899983E 00	s	5.119054E-05
3.999983E 00	s	5.236772E-05
4.099982E 00	s	5.353833E-05
4.199982E 00 4.299981E 00 4.399981E 00	s s	5.470245E-05 5.586015E-05 5.701146E-05
4.499980E 00	S	5.815648E-05

TIME	TYPE	VALUE
0.0	S S	
9.999996E-02		
1.999999E-01	S	2.967905E 02
2.999999E-01	S	2.947634E 02
3.999999E-01	S	2.927634E 02
4.999998E-01	S	2.907905E 02
5.999998E-01	S	2.868438E 02
6.999997E-01	S	2.869226E 02
7,999997E-01	S	2.850264E 02
8.999997E-01	s	2.831545E 02
9.999996E-01	S	2.813066E 02
1.099999E 00	S	2.794819E 02
1.199999E 00	Š	2.776802E 02
1.299998E 00	Š	2.759009E 02
1.399998E 00	Š	2.741433E 02
1.499997E 00	Š	2.724072E 02
1.599997E 00	s s	2.706921E 02
1.699996E 00	Š	2.689976E 02
1.799995E 00	S	2.673230E 02
1.699995E 00	S	2.656680E 02
	5 5	2.640325E 02
2.099994E 00	S	
2.199993E 00	S	2.608176E 02
2.299993E 00	S	2.592375E 02
2.399992E 00	S	2.576753E 02
2.499991E 00	S	2.561306E 02
2.599991E 00	S	2.546031E 02
2.699990E 00	S S	2.530924E 02
2.799990E 00	S	2.515980E 02
2.899989E 00	S	2.501199E 02
2.999989E 00	S	2.486575E 02
3.099988E 00	S	2.472108E 02
3.199987E 00	S	2.457793E 02
3.299987E 00	S	2.443627E 02
3.399986E 00	S	2.429608E 02
3.499986E 00	S	2.415735E 02
3.599985E 00	S	2.402004E 02
3.699985E 00	S	2.388411E 02
3.799984E 00	S	2.374956E 02
3.899983E 00	Š	2.361636E 02
3.999983E 00	š	2.348447E 02
4.099982E 00	s s s s	2.335388E 02
4.199982E 00	Š	2.322458E 02
4.299981E 00	Š	2.309653E 02
4.399981E 00	Š	2.296971E 02
4.499980E 00	Š	2.284411E 02

```
NASTRAN LOADED AT LOCATION 177720
TIME TO GO = 59 CPU SEC., 238 I/O SEC.
     O CPU·SEC.
                        O ELAPSED-SEC.
                                            SEM1
                                                  BEGN
                                            SEMT
                        O ELAPSED-SEC.
     O CPU-SEC.
     O CPU-SEC.
                        3 ELAPSED-SEC.
                                            NAST
     O CPU-SEC.
                        4 ELAPSED-SEC.
                                            GNFI
                        4 ELAPSED-SEC.
                                            XCSA
     O CPU-SEC.
                                            IFP1
     O CPU-SEC.
                        6 ELAPSED-SEC.
     O CPU-SEC.
                        8 ELAPSED-SEC.
                                            XSOR
     O CPU-SEC.
                       11 ELAPSED-SEC.
                                              DO
                                                  IFP
     1 CPU-SEC.
                       24 ELAPSED-SEC.
                                             END
                                                  IFP
                                            XGPI
     1 CPU-SEC.
                       24 ELAPSED-SEC.
     2 CPU-SEC.
                       29 ELAPSED-SEC.
                                            SEM1 END
                       29 ELAPSED-SEC.
                                            - - - -
                                                  LINKNSO2 ---
     2 CPU-SEC.
    17 I/O SEC.
LAST LINK DID NOT USE 40016 BYTES OF OPEN CORE
                                            ---- LINK END ---
     3 CPU-SEC.
                       32 ELAPSED-SEC.
     3 CPU-SEC.
                       32 ELAPSED-SEC.
                                            XSFA
     3 CPU-SEC.
                       SI3 ELAPSED-SEC.
                                            XSFA
                                            3
                                                   GP1
                                                           BEGN
     3 CPU-SEC.
                       33 ELAPSED-SEC.
     3 CPU-SEC.
                       4.1 ELAPSED-SEC.
                                            3
                                                   GP1
                                                           END
     3 CPU-SEC.
                       "2 ELAPSED-SEC.
                                            8
                                                   GP2
                                                           BEGN
     3 CPU-SEC.
                       44 ELAPSED-SEC.
                                            8
                                                   GP2
                                                           END
     3 CPU-SEC.
                       45 ELAPSED-SEC.
                                            10
                                                   PLISET
                                                           BEGN
     3 CPU-SEC.
                       46 ELAPSED-SEC.
                                                   PLISET
                                                           END
                                            10
                                                   PRTMSG
                                                           BEGN
     3 CPU-SEC.
                       46 ELAPSED-SEC.
                                            12
                                                   PRTMSG
                                                           END
     3 CPU-SEC.
                       47 ELAPSED-SEC.
                                            12
      3 CPU-SEC.
                       47 ELAPSED-SEC.
                                                   SETVAL
                                                           BEGN
                                            13
                                                   SETVAL
                                                           END
      3 CPU-SEC.
                       47 ELAPSED-SEC.
                                            13
      3 CPU-SEC.
                       48 ELAPSED-SEC.
                                                   GP3
                                                           BEGN
                                            21
      3 CPU-SEC.
                                                           END
                        56 ELAPSED-SEC.
                                             21
                                                   GP3
      3 CPU-SEC.
                        57 ELAPSED-SEC.
                                             23
                                                   TA1
                                                           BEGN
      4 CPU-SEC.
                        64 ELAPSED-SEC.
                                                   TA1
                                                           END
      4 CPU-SEC.
                        65 ELAPSED-SEC.
                                                   LINKNSO3 ---
     47 I/O SEC.
LAST LINK DID NOT USE
                         82788 BYTES OF OPEN CORE
      4 CPU-SEC.
                        69 ELAPSED-SEC.
                                                   LINK END ---
                                             27
                                                            BEGN
      4 CPU-SEC.
                        69 ELAPSED-SEC.
                                                   SMA1
      4 CPU-SEC.
                                                   SMA1
                                                            END
                        71 ELAPSED-SEC.
                                             27
      4 CPU-SEC.
                        71 ELAPSED-SEC.
                                                   SMA2
                                                            BEGN
                                             30
                        "3 ELAPSED-SEC.
                                                   SMA2
                                                           END
      4 CPU-SEC.
                                             30
      4 CPU-SEC.
                        74 ELAPSED-SEC.
                                                   LINKNSO5 ---
     54 I/O SEC.
 LAST LINK DID NOT USE
                        71500 BYTES OF OPEN CORE
      4 CPU-SEC.
                        80 ELAPSED-SEC.
                                             ---- LINK END ---
                                             35
                                                   RMG
                                                            BEGN
      4 CPU-SEC.
                        80 ELAPSED-SEC.
      4 CPU-SEC.
                        36 ELAPSED-SEC.
                                             FBS
      4 CPU-SEC.
                        88 ELAPSED-SEC.
                                             FBS
      4 CPU-SEC.
                        90 ELAPSED-SEC.
                                             MPYA
                                                  D
                                                   METHOD 2 NT, NBR PASSES =
                                                                              1.EST. TIME =
                                                                                                    0.0
                                             MPYA D
      4 CPU-SEC.
                        91 ELAPSED-SEC.
      4 CPU-SEC.
                        91 ELAPSED-SEC.
                                             TRAN POSE
      4 CPU-SEC.
                        92 ELAPSED-SEC.
                                             TRAN POSE
                        92 ELAPSED-SEC.
                                             MPYA
                                                   D
      4 CPU-SEC.
                                                   METHOD 2 NT.NBR PASSES = 1.EST. TIME =
                                                                                                    0.0
      5 CPU-SEC.
                        93 ELAPSED-SEC.
                                             MPYA D
```

```
RMG
                                                           END
                       96 ELAPSED-SEC.
                                            35
     5 CPU-SEC.
                                                  LINKNSO4 ---
     5 CPU-SEC.
                       98 ELAPSED-SEC.
    69 I/O SEC.
                       72544 BYTES OF OPEN CORE
LAST LINK DID NOT USE
                                                  LINK END ---
                      104 ELAPSED-SEC.
     5 CPU-SEC.
                                            40
                                                  GP4
                                                           REGN
     5 CPU-SEC.
                      104 ELAPSED-SEC.
                                                  GP4
                                                           END
                                            40
     5 CPU-SEC.
                      107 ELAPSED-SEC.
                                                           BEGN
                                            46
                                                  GPSP
     5 CPU-SEC.
                      :C9 ELAPSED-SEC.
                                                  GPSP
     5 CPU·SEC.
                      1C9 ELAPSED-SEC.
                                            46
                                                           END
                                                  LINKNS14 ---
     5 CPU-SEC.
                      110 ELAPSED-SEC.
    77 I/O SEC.
LAST LINK DID NOT USE 124268 BYTES OF OPEN CORE
                                                  LINK END ---
     5 CPU-SEC.
                      118 ELAPSED-SEC.
                                            ----
                                                           BEGN
     5 CPU-SEC.
                      118 ELAPSED-SEC.
                                            47
                                                  OFP
                                            47
                                                  OFP
                                                           END
     5 CPU-SEC.
                      119 FLAPSED-SEC.
                                            XSFA
     5 CPU-SEC.
                      123 ELAPSED-SEC.
                                            XSFA
     5 CPU-SEC.
                      123 ELAPSED-SEC.
                                                  LINKNSO6 ---
     5 CPU-SEC.
                      123 ELAPSED-SEC.
                                            ----
    82 I/O SEC.
LAST LINK DID NOT USE 115664 BYTES OF OPEN CORE
                                                  'LINK END ---
     6 CPU-SEC.
                      125 ELAPSED-SEC.
                                            ----
                                                           BEGN
     6 CPU-SEC.
                      125 ELAPSED-SEC.
                                            75
                                                  DPD
     6 CPU-SEC.
                      133 ELAPSED-SEC.
                                            75
                                                   DPD
                                                           END
                                                  LINKNS10 ---
     6 CPU-SEC.
                      135 ELAPSED-SEC.
    90 I/O SEC.
LAST LINK DID NOT USE 116416 BYTES OF OPEN CORE
     6 CPU-SEC.
                      139 ELAPSED-SEC.
                                                  LINK END ---
     6 CPU-SEC.
                      139 ELAPSED-SEC.
                                            81
                                                   MTRXIN
                                                           BEGN
                                                   MTRXIN
                                                           END
     5 CPU-SEC.
                      140 ELAPSED-SEC.
                                            81
                      140 ELAPSED-SEC.
                                            83
                                                   PARAM
                                                           BEGN
     6 CPU-SEC.
                                                   PARAM
                                                           END
     6 CPU-SEC.
                      140 ELAPSED-SEC.
                                            83
                                                           BEGN
     6 CPU-SEC.
                      141 ELAPSED-SEC.
                                            88
                                                   GKAD
     & CPU-SEC.
                      144 ELAPSED-SEC.
                                            88
                                                   GKAD
                                                           END
                                            XSFA
     6 CPU-SEC.
                      144 ELAPSED-SEC.
                                            XSFA
     5 CPU-SEC.
                      145 ELAPSED-SEC.
                                                  LINKNSO5 ---
     6 CPU-SEC.
                      145 ELAPSED-SEC.
                                            ----
    97 I/O SEC
LAST LINK DID NOT USE 117064 BYTES OF OPEN CORE
                                            ---- LINK END ---
     6 CPU-SEC.
                      148 ELAPSED-SEC.
                                                   TRLG
                                                           BEGN
     6 CPU-SEC.
                      148 ELAPSED-SEC.
                                            92
                                            92
                                                   TRLG
                                                           END
     6 CPU-SEC.
                      151 ELAPSED-SEC.
                                                  LINKNS11 ---
     6 CPU-SEC.
                      152 ELAPSED-SEC.
                                            • - - -
    99 I/O SEC.
LAST LINK DID NOT USE
                       79780 BYTES OF OPEN CORE
                      154 ELAPSED-SEC.
                                            ----
                                                  LINK END ---
     7 CPU-SEC.
                                            97
                                                   TRHT
                                                           BEGN
     7 CPU-SEC.
                      154 ELAPSED-SEC.
                                                   TRHT
                                                           END
                      2:8 ELAPSED-SEC.
                                            97
     8 CPU-SEC.
                      218 ELAPSED-SEC.
                                                   LINKN512 ---
     8 CPU-SEC.
   156 I/O SEC.
                         69268 BYTES OF OPEN CORE
LAST LINK DID NOT USE
                                                  LINK END ---
     8 CPU-SEC.
                      233 ELAPSED-SEC.
                                            ----
                                                           BEGN
                      223 ELAPSED-SEC.
                                            99
                                                   VDR
     8 CPU-SEC.
                                                   VDR
                                                           END
     8 CPU-SEC.
                      228 ELAPSED-SEC.
                                            99
                                                           BEGN
     8 CPU-SEC.
                      228 ELAPSED-SEC.
                                            111
                                                   PARAM
                                                           END
     8 CPU-SEC.
                      228 ELAPSED-SEC.
                                            111
                                                   PARAM
                      229 ELAPSED-SEC.
                                                   LINKNSOB ---
     8 CPU-SEC.
   164 I/O SEC.
LAST LINK DID NOT USE 119112 BYTES OF OPEN CORE
                                                  LINK END ---
                      235 ELAPSED-SEC.
     8 CPU-SEC.
                                                   PLTTRAN BEGN
     8 CPU-SEC.
                      235 ELAPSED-SEC.
                                            118
                      237 ELAPSED-SEC.
                                            118
                                                   PLTTRAN END
     8 CPU-SEC.
                                            XSFA
     8 CPU-SEC.
                      237 ELAPSED-SEC.
                                            XSFA
     B CPU-SEC.
                      238 ELAPSED-SEC.
```

238 ELAPSED-SEC.

LINKNS13 ---

The same

8 CPU-SEC.

```
= 163 I/O SEC.
LAST LINK DID NOT USE 107808 BYTES OF OPEN CORE
     8 CPU-SEC.
                    240 ELAFSED-SEC.
                                       ---- LINK END ---
     8 CPU-SEC.
                    240 ELAPSED-SEC.
                                        120 SDR2 BEGN
     9 CPU-SEC.
                    242 ELAPSED-SEC.
                                        120 SDR2 END
     9 CPU-SEC.
                                        ---- LINKNS14 ---
                    242 ELAPSED-SEC.
  171 I/O SEC.
LAST LINK DID NOT USE 65428 BYTES OF OPEN CORE
     3 CPU-SEC.
                    248 ELAPSED-SEC.
                                         ---- LINK END ---
     3 CPU-SEC.
                     248 ELAPSED-SEC.
                                        121 SDR3
                                                      BEGN
     9 CPU-SEC.
                     253 ELAPSED-SEC.
                                        121 SDR3
                                                      END
     9 CPU-SEC.
                    253 ELAPSED-SEC.
                                        123 OFP
                                                      BEGN
     3 CPU-SEC.
                     255 ELAPSED-SEC.
                                        123 OFP
                                                      END
     9 CPU-SEC.
                     255 ELAPSED-SEC.
                                        130 XYTRAN BEGN
     3 CPU-SEC.
                     255 ELAPSED-SEC.
                                        130 XYTRAN END
     9 CPU-SEC.
                     255 ELAPSED-SEC.
                                         ---- LINKNSO2 ---
   179 I/O SEC.
LAST LINK DID NOT USE 44048 BYTES OF OPEN CORE
     9 CPU-SEC.
                     263 ELAPSED-SEC.
                                         ---- LINK END ---
     9 CPU-SEC.
                     263 ELAPSED-SEC.
                                         132 XYPLOT BEGN
                     263 ELAPSED-SEC.
     9 CPU-SEC.
                                         132 XYPLOT END
     9 CPU-SEC.
                     263 ELAPSED-SEC.
                                         138 EXIT
                                                      BEGN
= 181 I/O SEC.
LAST LINK DID NOT USE 97232 SYTES OF OPEN CORE
 AMOUNT OF OPEN CORE NOT USED = 39K BYTES
```


MIAISTANCA EN INNESSE MENTANTA MARAMANA
ММУСТИДИМИЗЕТИМЫМИЗЕТИМИМИМИМИЗЕТИМИСТИМИМ

MRIA SAMMELERAMANANAN MANGANAGA - MAGALEMBARASAMBARASAMBARAMBANAM

MMMELS SCHEEFE NIMERIMMENMER WERENGEREICHMER BEIMMMERSWERENMEN MER IN MAN DER GERENGEN WEREN MER DER GERENGEN WEREN MINISTRACION MINISTRACION MINISTRACION MANOREMENTO MAN

MIGMARMICAN COMMERCIAN DE PROMOTO COMPANIA MARCANDA DE PROMOTO DE

MMMMM - 1/1/// ABBRIDGEMENDE - 1/1/// ABBRIDGEMENDE - 1/1/// ABBRIDGEMENDE - 1/1/// ABBRIDGEMENDE - 1/1/// ABBRIDGEMENDE - 1/1/// ABBRIDGEMENDE - 1/1/// ABBRIDGEMENDE - 1/1/// ABBRIDGEMENDE - 1/1/// ABBRIDGEMENDE - 1/1/// ABBRIDGEMENDE - 1/1/// ABBRIDGEMENDE - 1/1/// ABBRIDGEMENDE - 1/1/// ABBRIDGEMENDE - 1/1// ABBRIDGEMEND - 1/1// ABBRIDGEMEND - 1/1// ABBRIDGEMEND - 1/1// ABBRIDGEMEND - 1/1// ABBRIDGEMEND - 1/1// ABBRIDGEMEND - 1/1// ABBRIDGEMEND - 1/1// AB

MMADAMMMA MMMMMMM MODINIM MANAMAMAMAMAM /MM - -Mod MMMMMM MIMMMM MIMMM MMMM MMMMMM/// /// M MM--MMM MMMMMMMM MMMMMMM MINIMAM MMM MMM M MMMM MMM MMMMM Mili MMEMMAHAMM MINIMAMM MMMMMAM M MMMMM - - MMMMM 11111111 MMMMMMM M MMM MMM MMM MMMMM MM /////MMM MMRSMRMMMMM M MERT MMMM// /// MMMMH - MMMMM MMMMMMMM M MMM MMM MM MMMM MM MMMMMMMM M:M MMOOMISSIMM ---M MMGGGMM MARKINAMA MM 1111 111 MMM MMMM MM MMWM MM MMMMMMMM MINIMA / /// ///MM MMMMMMM - - - M MMMMMM MMMCGMMM MMMMMM MMMM MM MMMMMM MASSACKANIA // M MMMMA - - - MMMM MOSCOWAS MMNIMBIAM M MMM мимимимими 11111 MM MMMMM MIMIMIMIM MMMMMMM MMM MMM - - - - MMMM MM////// M MMMM MMSMSMM M MMM MM MMMM MM MMMM ////MMMMMMM MINIMINIM MM MMMMM MM MIGH MIGMMIN MM MM MMMM MMMMMM MMMM MM

MARIANAMANA MARIANAMA MINAMANAMANAMAMAH - - - MAMMANA MARIA PARAMANAMAN MARIANAMAN MARIANAMANAMANAMAN MARIANAMANAMAN MARIANAMANAMAN MARIANAMAN MARIA MANAGEMENTANDE MANAMARIAN MANAMAR

ММИРИЗИМИМЕНИМИМУ ВО ВЕРОИНЕ - - МЕТОГОВИМ MINIMINIANISMINIMINIANISMINIMI MINIMINI PAGAMANIMI MMMMMMMMMMMMMMM = - - MMMMMMMM

мальный министрительный марительный марительный приментации примен - МИМИМОРИМИНИЯ - - - МОГУЛИМАМИЛИМИНИВИЗИТЕЛЬНИКИ МОГИТИРИ В МОГ

IMMSAMMAMSASSAMMA

MANAGEMENT AND AN AND AN AND AN AND AN AND AN AND AN AND AN ANALOGO AND AN AND AN AND AN AND AN AND AN ANALOGO AND AN ANALOGO AND AN ANALOGO AND ANALOGO ANALO

ММИМИМИМИМИМИМИМИМИМИМИМИМИМИМИМИМИМ

SYSTEM GENERATION DATE - 12/31/74

MMM

IBM 360-370 SERIES

RIGID FORMAT SERIES M

LEVEL 15.5.3

MODELS 91.95

- 日本は高いのできる

CASE, CONTROL DECK ECHO

```
CARD
COUNT
 1
        TITLE=
                   NON-LINEAR TRANSIENT PROBLEM ...
        SUBTITLE=
                        TRANSFER FUNCTION AND ARBITRARY NON-LINEAR LOADS
 9
        $ SPECIFY 51 LINES OF DATA PER PAGE (DOES NOT INCLUDE HEADINGS AT TOP OF PAGE)
10
11
        LINE=51
12
13
        $ REQUEST SORTED AND UNSORTED OUTPUT
        $ IF THIS CARD IS OMITTED, ONLY THE SORTED BULK DATA WILL APPEAR
14
15
16
        ECHO=BOTH
17
18
        $ SELECT THE MPC AND LOAD SETS TO BE USED IN THIS SOLUTION
19
        $ NOTE THAT NO SPC SET IS SELECTED, AND THAT DLOAD HAS REPLACED LOAD.
20
21
        MPC=200
22
        DLOAD=300
23
24
        $ SELECT THE SET NUMBER OF THE NOLIN CARDS TO BE USED IN THIS PROBLEM
25
26
        NONLINEAR=900
27
28
        $ SELECT THE SET NUMBER OF THE TF CARDS TO BE USED IN THIS SOLUTION
29
30
        TFL=902
31
        $
32
        $ SELECT THE TEMPERATURE SET WHICH IS AN ESTIMATE OF THE FINAL SOLUTION VECTOR
33
        $ THE SELECTION OF THIS SET IS OPTIONAL FOR SOL 9. BUT SHOULD BE MADE IF
34
        $ THE FINAL TEMPERATURE IS SEVERAL HUNDRED DEGREES DIFFERENT FROM THE
35
        $ IC VECTOR, AND RADIATIVE INTERCHANGES ARE INCLUDED.
36
37
        TEMP(MATERIAL)=400
38
39
        $ SELECT THE STEP SIZE. NUMBER OF INCREMENTS. AND PRINTOUT FREQUENCY
40
        S.
41
        TSTEP=500
42
43
        $ SELECT THE TEMPERATURE SET DEFINING THE TEMPERATURE VECTOR AT T=0.
45
        IC=600
46
        $
47
        $ SELECT OUTPUT DESIRED
48
49
        OUTPUT
50
        THERMAL=ALL
```

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CASE CONTROL DECK ECHO

INPUT викк DATA DECK FCHO

```
8 ..
                                                                       9 .. 10 .
$ UNITS MUST BE CONSISTENT
$ IN THIS PROBLEM. METERS, WATTS, AND DEGREES CELSIUS ARE USED
S DEFINE GRID POINTS
GRID
                                          0.
GRID
        2
                         . 1
                                          Ω.
GRID
        3
                         . 2
                                          ٥
GRID
                         . 3
                                 ٥.
                                          n.
GRID
        5
                                          o.
                         О.
                                 . 1
GRID
                                          ο.
GRID
                         . 2
                                          α.
                                 . 1
GRID
                         . З
                                 . 1
                                          ο.
GRID
                         Ο.
                                 . 2
                                          Ο.
GRID
        10
                         0.
                                          Ο.
GRID
                         -.05
        100
                                 .05
                                          ο.
$
S CONNECT GRID POINTS
$
CROD
        10
                 100
                         10
                         9
CROD
        20
                 100
                                 6
CQUAD2
        30
                 200
                         1
                                                  5
CQUAD2
        40
                         2
                 200
                                 3
                                          7
                                                  6
                         3
                                 4
CQUAD2
        50
                200
$ DEFINE CROSS-SECTIONAL AREAS AND/OR THICKNESSES
$
PROD
        100
                 1000
                         .001
PQUAD2 200
                 1000
                         . 01
S DEFINE MATERIAL THERMAL CONDUCTIVITY AND THERMAL MASS
$
MAT4
        1000
                 200.
                                                                           ALUMINUM
                         2.426+6
5
S DEFINE CONVECTIVE AREA AND CONVECTIVE COEFFICIENT 'H'
CHBDY
        60
                300
                         LINE
                                          5
                                                                           +CONVEC
+CGNVEC 100
                100
PHEDY
        300
                3000
                         .314
MAT4
        3000
                200.
$ DEFINE CONSTRAINTS
MPC
        200
                                                           -1.
                                 1.
MPC
                10
                                 1.
                                                           -1.
        200
S DEFINE APPLIED LOADS
$
        300
                                 2
                                          8.
SLOAD
```

```
INPUT BULK DATA DECK ECHO
                              .. \ 5
                                           6 .. 7 .. 8 .. 9 .. 10 .
SLOAD
       300
                       8.
                                       4.
               3
                               4
                                       8.
       300
                               6
SLOAD
                       4.
SLOAD
       300
                       8.
                                       4.
$ THE FOLLOWING BULK DATA CARDS WERE ADDED TO CONVERT PROBLEM ONE TO
S PROBLEM TWO. THE ONLY BULK DATA CALD REMOVED FROM THE PREVIOUS SOLUTION WAS
S THE SPC CARD
$
$ THIS SPC1 CARD REPLACES THE SPC CARD REMOVED FROM ABOVE
$
SPC1
       100
                       100
$
$ RADIATION BOUNDARY ELEMENTS
S
CHBDY
       200
               2000
                       AREA4
CHBDY
       300
               2000
                       AREA4
                               2
                                                       6
CHBDY
       400
                       AREA4
               2000
CHBDY
        500
               2000
                       AREA4
                                       6
CHEDY
        600
               2000
                       AREA4
                               6
                                       7
                                                       2
CHBDY
               2000
                       AREA4
                               7
       700
$
$ EMISSIVITY OF RADIATING ELEMENT
$
PHBDY
       2000
                                .90
$ ESTIMATE OF FINAL STEADY STATE SOLUTION VECTOR --- REFERENCED
$ BY TEMP(MATERIAL) IN CASE CONTROL
$
SEMP
        400
                100
                        300.
TEMPD
       400
                300.
$
S PARAMETERS CONTROLLING RADIATION LOADING AND THE ITERATION LOOPING
S
PARAM
       SIGMA
               5.685E-8
PARAM
        MAXIT
PARAM
        TABS
                273.15
PARAM
       EPSHT
                .0001
$ DEFINITION OF THE RADIATION MATRIX
S ALL OF THE RADIATION GOES TO SPACE
                                               700
SADLST 200
                300
                        400
                                500
                                        600
RADMIX 1
                        0.
                0.
                                Ο.
                                        Ο.
                                               Ο,
                                                       Ο.
RADMIX 2
                Ο.
                                ٥.
                                       Ο.
                                               ο.
                        ο.
RADMIX 3
                0.
                        0.
                               Ο.
RADMTX 4
                Ο.
                               Ο.
                        Ο.
RADMIX 5
                ٥.
                        Ο.
RADMTX 6
                0.
$
```

INPUT BULK DATA DECK ECHO

```
1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 .
$ THE FOLLOWING BULK DATA CARDS WERE ADDED FOR THE TRANSIENT SOLUTION ------
$ THEY CONVERT PROBLEM TWO TO PROBLEM THREE
$ NOTE THAT THE SPC1 SET WAS NOT SELECTED IN CASE CONTROL
$ NOTE THAT SPCF OUTPUT IS NOT REQUESTED IN TRANSIENT
$ NOTE THAT THERMAL MASS WAS ADDED TO 'MAT4' CARD 1000
$ NOTE THAT THE DIAG CARD IN THE EXECUTIVE CONTROL WAS IRRELEVANT
$ NOTE THAT THE LOAD REQUEST IN CASE CONTROL IS NOW A DLOAD REQUEST
$ TRANSIENT SINGLE POINT CONSTRAINT METHOD
$ CONSTRAIN GRID POINT 100 TO 300 DEGREES CELSIUS
CELAS2 300
                       100
               1.+5
                             1
$LOAD 300
               100
                       300.+5
$ DEFINES A CONSTANT LOAD SET APPLIED FROM T=0. TO T=1.+6 SECONDS
TLOAD2 300
               300
                                               1.+6
                                                                      +TL1
+TL1 0.
               Ο.
$ DEFINES THE NUMBER OF INCREMENTS, THE STEP SIZE, AND THE PRINTOUT FREQUENCY
$ REFERENCED IN CASE CONTROL AS 'TSTEP'
$ EACH TIME STEP IS 30 SECONDS
SSTEP 500
                       30.
               45
$ DEFINES A TEMPERATURE VECTOR --- REFERENCED IN CASE CONTROL AS 'IC'
TEMPD 600
               300.
$ THE FOLLOWING BULK DATA CARDS WERE USED TO CONVERT PROBLEM THREE TO
$ PROBLEM 20. GRID POINT 904 HAS ITS TEMPERATURE CONTROLLED BY A TRANSFER
$ FUNCTION. TEMPERATURE DEPENDENT NON-LINEAR LOADS
$ ARE APPLIED TO GRID POINTS 1 AND 5 RESPECTIVELY.
$ THE ONLY OTHER CHANGES MADE WERE THE ADDITION OF A NONLINEAR AND A
$ NLLOAD REQUEST TO THE CASE CONTROL. A REDUCTION IN THE TSTEP
$ TIME INCREMENTS TO 1 SECOND EACH (THE OLD TSTEP CARD WAS MADE INTO A COMMENT).
$ THE REMOVAL OF THE LINEAR LOAD OUTPUT REQUEST (OLOAD=ALL) FROM CASE CONTROL.
$ THE REMOVAL OF THE PRINTER PLOT OUTPUT PACKAGE FROM CASE CONTROL.
$ THE REMOVAL OF THE RADLST CARD TO ELIMINATE ANY RADIATIVE EFFECTS (WHICH
$ WOULD OBSCURE THE NON-LINEAR LOADS APPLIED BY THE NOLIN CARDS). AND THE
$ CHANGE OF THE BASE TEMPÉRATUPE OF THE FIN TO 200 DEGREES C (TO ENSURE THAT
S THE FIN WOULD COOL OFF FROM ITS INITIAL TEMPERATURE EVEN THOUGH THE RADIATIVE
$ HEAT LOSSES HAD BEEN REMOVED).
$ EACH TIME STEP IS ONE SECOND
TSTEP
       500
               45
                       1.
```

PAGE

INPUT BULK DATA DECK ECHO

. 1 .. 2 .. 3 .. 4 .. 5 .. 6 .. 7 .. 8 .. 9 .. 10 . 5 CHANGES MADE TO ALTER THE BASE TEMPERATURE OF THE FIN TO 200 C. S PREVIOUS SLOAD AND TEMP CARDS WERE CONVERTED TO COMMENTS. \$ 100 200.+5 SLOAD 300 200. TEMP 400 100 TEMP 600 100 200. \$ S APPLY NON-LINEAR LOADS AS A FUNCTION O. TEMPERATURE 9004 NOLIN1 900 1 1. NOLINI 900 5 . 5 5 9004 TABLED1 9004 +TAB1 +TAB1 270. 30. 300. 0. 301. ٥. ENDT S DEFINE A NEW GRID POINT (904) AND CONSTRAIN ITS TEMPERATURE TO THE S NEGATIVE OF THE TEMPERATURE OF GRID POINT 4 BY USING A TRANSFER FUNCTION. GRID 904 TF 902 1. Ο. +TF1 904 0. Ο. +TF1 Ο. 4 1 ENDDATA

TOTAL COUNT= 178

*** USER INFORMATION MESSAGE 207. BULK DATA NOT SORTED, XSORT WILL RE-ORDER DECK.

			s 0	R T E 'D	BUL	V D A	T A E	сно				
CARD			3 0	K 1 L D	D 0 L	K DA		C 11 0				
COUNT	1	. 2 .	. 3	4	5	6	7	8		9	4	_
1-			. J 1 +5	100	5 1	., 6	7	0	• •	9	1	υ.
2-			300	LINE	1	5					+CON	VEC
3-	+CONVEC 1		100	LINE	'	3					TCON	VEC
4-			2000	AREA4	1	2	6	5				
5-			2000	AREA4	2	3	7	6				
6-			2000	AREA4	3	4	8	7				
7-			2000	AREA4	5	6	2	í				
8-			2000	AREA4	6	7	3	2				
9-			2000	AREA4	7	8	4	3				
10-			2000	1	2	6	5	3				
11-			200	2	3	7	6					
12-			200	3	4	8	7					
13-			100	10	2	6	'					
14-			100	9	6							
15-	GRID 1		100	0.0	0.0	0.0						
16-	GRID 2			.1	0.0	0.0						
17-	GRID 3			. 2	0.0	0.0						
18-	GRID 4			.3	0.0	0.0						
19-	GRID 5			0.0	. 1	0.0						
20-	GRID 6			.1	. 1	0.0						
21-	GRID 7			. 2	. 1	0.0						
22-	GRID 8			.3	. 1	0.0						
23-	GRID 9			0.0	. 2	0.0						
24-		ío		0.0	1	0.0						
25 <i>-</i>		00		05	. 05	0.0						
26-		904		.05	.05	0.0						
27-			200.	2.426+6							ALUM	TNUM
28-			200.	220.0							7.000	11.0111
29-			9	1	1.	5	1	-1.				
30-			10	1	1.	1	1	-1.				
31 -			1	1	1.	1	1	9004				
32-			5	1	. 5	5	1	9004				
33 -			.0001		. •	_						
34-			8									
35 -			5.685E-8	3								
36 -			273.15									
37-			3000	.314								
38-		2000			.90							
39-			1000	.01								
40 -	PROD 1	00	1000	.001								
41 -	RADMTX 1		0.0	0.0	0.0	0.0	0.0	0.0				
42 -	RADMTX 2	2 (0.0	0.0	0.0	0.0	0.0					
43-	RADMTX 3		0.0	0.0	0.0	0.0						
44-	RADMTX 4		0.0	0.0	0.0			•				
45 -	RADMTX 5	5 (0.0	0.0								
46-	RADMTX 6	5 (0.0									
47-	SLOAD 3	300 .	1	4.	2	8.						
48-	SLOAD 3	300	3	8.	4	<i>.</i>						
49 -	SLOAD 3	300 5	5	4.	6	8.						
50-	SLOAD 3		7	8.	8	4.						
51 -			100	200.+5								

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			S	ORT	ED E	ง บ	LK	D	ΑТА	- 1	ECH	1 0				
CARD																
COUNT	. 1	2	3	·	4	5		6		7		8		9	10	١.
52-	SPC1	100	1	100												
53 <i>-</i>	TABLED1	9004													+TAB1	
54 -	+TAB1	270.	30.	300.	Ο.		301	١.	Ο.		EN	ΤC				
55-	TEMP	400	100	200.												
56-	TEMP	600	100	200.												
57 -	TEMPD	400	300.													
58 -	TEMPD	600	300.													
59-	TF	902	904	1	1.		0.0)	0.0						+TF1	
60-	+TF1	4	1	1.	Ο.		Ο.									
61 -	TLOAD2	300	300				0.0	כ	1.+6	3	0.0	כ	0.0	3	+TL1	
62-	÷TL1	Ο.	Ο.													
63 -	TSTEP	500	45	1.	1											
	ENDDATA															

4

NASTRAN SOURCE PROGRAM COMPILATION DMAP-DMAP INSTRUCTION NO.

- *** USER WARNING MESSAGE 54.
 PARAMETER NAMED EPSHT NOT REFERENCED
- *** USER WARNING MESSAGE 54.
 PARAMETER NAMED MAXIT NOT REFERENCED
 - **NO ERRORS FOUND EXECUTE NASTRAN PROGRAM**



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- *** USER WARNING MESSAGE 2015. EITHER NO ELEMENTS CONNECT
 INTERNAL GRID POINT 12 OR IT IS CONNECTED TO A RIGID ELEMENT OR A GENERAL ELEMENT.
- *** USER INFORMATION MESSAGE FULL INTERNAL SPACE NODE AVAILABLE

- *** USER INFORMATION MESSAGE 3028. B = 5 BBAR = 4 C = 2 CBAR = 2
- *** USER INFORMATION MESSAGE 3C27, UNSYMMETRIC REAL DECOMPOSITION TIME ESTIMATE IS O SECONDS.

TIME		TYPE	VALUE
0.0		s s	0.0
1.0000COE	00		7.255859E-01
2.000000E	00	S c	2.022461E 00
3.000000E 4.000000E	00	s s	3.281738E 00 4.505859E 00
5.000000E	00	S	5.698045E 00
6.000000E	00	Š	6.853516E 00
7.000000E	00	S	7.979004E 00
8.000000E	00	S	9.073975E 00
9.00000E	00	S	1.013843E 01
1.000000E	01	S	1.117407E 01
1.100000E	01	s s	1.218164E 01 1.316162E 01
1.200000E	01 01	S	1.316162E 01 1 411548E 01
1.400000E	01	S	1.504346E 01
1.500000E	01	Š	1.594653E 01
1.600000E	01	S	1.682568E 01
1.700000E	01	S	1.769066E 01
1.800000E	01	S	1.851294E 01
1.900000E	01	S	1.932373E 01
2.000000E 2.100000E	01 01	s s	2.011255E 01 2.088062E 01
2.200000E	01	S	2.162866E 01
2.300000E	01	Š	2.235718E 01
2.400000E	01	S	2.306689E 01
2.500000E	01	S	2.375830E 01
2.6000CCE	01	S	2.443188E 01
2.70000CE	01	S S	2.508838E 01 2.572803E 01
2.800000E 2.900000E	01 01	5 5	2.572803E 01 2.635156E 01
3.000000E	01	S	2.695947E 01
3.1000G0E	01	s	2.755200E 01
3.200000E	01	S	2.812988E 01
3.300000E	01	S	2.869336E 01
3.400000E	01	S	2.924292E 01
3.500000E	01	S	2.977881E 01
3.600000E 3.700000E	01 01	s s	3.030176E 01 3.081177E 01
3.600000E	01	S	3.130957E 01
3.900000E	01	Š	3.179541E 01
4.000000E	01	S	3.226953E 01
4.100000E	01	S	3.273242E 01
4.20000E	01	S	3.318433E 01
4.3C0000E	01	s	3.362549E 01
4.400000E	01	S S	3.405640E 01 3.447729E 01
4.5000002	01	3	J.44//23E U!



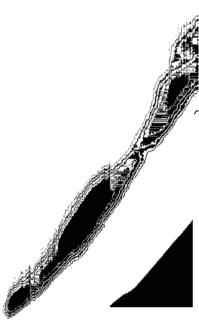
NON-LINEAR-FORCE VECTOR

TIME	TYPE	VALUE
0.0	s s	0.0
1.0000C0E 00 2.0000C0E 00	S	3.629150E-01 1.012572E 00
3.000000E 00	S	1.645141E 00
4.000000E 00	S	2.261352E 00
5.000000E 00	S	2.861693E 00
6.000000E 00 7.00000CE 00	s s	3.446898E 00 4.017211E 00
8.00000CE 00	S	4.572997E 00
9.0000COE 0C	S	5.114623E 00
1.000000E 01	S	5.642577E 00
1.100000E 01 1.200000E 01	S S	6.157470E CO 6.6593C1E OO
1.300000E 01	S	7.148925E 00
1.400000E 01	S	7.626220E 00
1.500000E 01	S S	8.091795E 00
1.600000E 01 1.700000E 01	5 S	8.545530E 00 8.988279E 00
1.800000E 01	S	9.420042E 00
1.90000CE 01	S	9.841307E 00
2.000000E 01 2.100000E 01	s s	1.025220E 01 1.065332E 01
2.200000E 01	S	1.104468E 01
2.300000E 01	S	1.142663E 01
2.400000E 01 2.500000E 01	S	1.179956E 01 1.216357E 01
2.600000E 01	s s s s s s s	1.251904E 01
2.700000E Q1	S	1.286609E 01
2.800000E 01	S	1.320508E 01
2.900000E 01 3.000000E 01	\$	1.353613E 01 1.385950E 01
3.100000E 01	S	1.417541E 01
3.200000E 01	S	1.448413E 01
3.300000E 01 3.400000E 01	S S	1.478576E 01
3.500000E 01	5 5	1.508056E 01 1.536877E 01
3.6000008 01	S	1.565039E 01
3.700000E 01	S	1.592578E 01
3.800000E 01 3.90000E 01	s s	1.619493E 01 1.645824E 01
4.000000E 01	S	1.671568E 01
4.1000CGE 01	s s	1.696751E 01
4.200000E 01 4.30000CE 01	S S	1.721385E 01 1.745494E 01
4.400000E 01	S	1.769078E 01
4.500000E 01	S	1.792162E 01

8.35

POINT-ID =

TIME	TYPE	VALUE
0.0	S	3.000000E 02
1.000000E 00	S	2.992744E 02
2.000000E 00	S	2.992744E 02 2.979775E 02
3.000000E 00	3	2.967183E 02
4.000000E 00	5	2.954941E 02
5.000000E 00	3	2.954941E 02 2.943040E 02
6.000000E 00	5 5 5	
7.000000E 00	5	2.931465E 02 2.920210E 02
8.000000E 00	S	2.920210E 02 2.909260E 02
9.000000E 00	S	
1.0000COE 01	5	2.898616E 02 2.888259E 02
1.100000E 01	S S	2.878184E 02
1.20J000E 01	5	2.868384E 02
1.300000E 01	S S	2.858845E 02
1.400000E 01	S	
1.500000E 01	S	
1.600000E 01	S	2.840535E 02 2.831743E 02
1.700000E 01	S	2.831743E 02 2.823193E 02
1.800000E 01	S	2.823793E 02 2.814871E 02
1.900000E 01	5	2.806763E 02
2.000000E 01	S	2.798875E 02
2.100000E 01	S	2.791194E 02
2.200000E 01	S	2.783713E 02
2.300000E 01	S	2.776428E 02
2.400000E 01	S	2.769331E 02
2.500000E 01	S	2.762417E 02
2.600000E 01	S	2.755681E 02
2.700000E 01	S	2.749116E 02
2.800000E 01	Š	2.742720E 02
2.900000E 01	5 S	2.736484E 02
3.000000E 01	Š	2.730405E 02
3.100000E 01	S S	2.724480E 02
3.200000E 01	Š	2.718701E 02
3.300000E 01	Š	2.713066E 02
3.400000E 01		2.707571E 02
3.500000E 01	S S	2.702212E 02
3.600000E 01	Š	2.696982E 02
3.700000E 01	Š	2.691882E 02
3.800000E 01	Š	2.686904E 02
3.900000E 01	5	2.682046E 02
4:000000E 01	š	2.677305E 02
4.100000E 01	S	2.672676E 02
4.200000E 01	Š	2.668157E 02
4.300000E 01	Š	2.663745E 02
4.400000E 01	Š	2.659436E 02
4.500000E 01	Š	2.655227E 02
	-	2.0002271 02



NON-LINEAR TRANSIENT PROBLEM ...
TRANSFER FUNCTION AND ARBITRARY NON-LINEAR LOADS

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PAGE

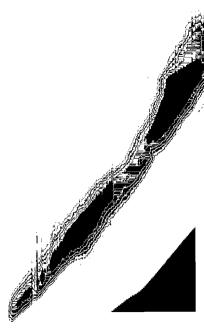
POINT-ID = 2

TIME	TYPE	VALUE
0.0 1.000000E 00	S S	3.000000E 02 3.000107E 02
2.0000CGE 00	s s	3.000254E 02
3.000000E 00 4.000000E 00	S	3.000295E 02 3.000237E 02
5.000000E 00	S	3.000083E 02
6.000000E 00 7.000000E 00	s s	2.999839E 02 2.999502E 02
8.000000E 00	S	2.999087E 02
9.000000E 00 1.000000E 01	s s	2.998584E 02 2.999003E 02
1.100000E 01 1.200000E 01	s s s	2.997349E 02 2.996621E 02
1.3000C0E 01	S	2.996621E 02 2.995825E 02
1.400000E 01 1.500000E 01	s s	2.994961E 02 2.994036E 02
1.600000E 01	S	2.993052E 02
1.700000E 01	s s	2.992007E 02 2.990908E 02
1.900000E 01	S	2.989756E 02
2.000000E 01 2.100000E 01	\$ \$	2.988555E 02 2.987307E 02
2.200000E 01	S S	2.986008E 02
2.300000E 01 2.4000C0E 01	S	2.984668E 02 2.983289E 02
2.500000E 01	S	2.981865E 02
2.600000E 01 2.700000E 01	s s	2.980405E 02 2.978911E 02
2.800000E 01 2.900000E 01	s s	2.977378E 02
2.900000E 01 3.000000E 01	S	2.975813E 02 2.974216E 02
3.100000E 01 3.200000E 01	s s	2.972590E 02 2.970935E 02
3.300000E 01	S	2.969253E 02
3.400000E 01 3.500000E 01	S	2.957546E 02 2.965818E 02
3.600000E 01	Ş	2.964065E 02
3.700000E 01 3.600000E 01	s s s s s	2.962288E 02 2.960493E 02
3.900000E 01	S	2.958677E 02
4.000000E 01 4.100000E 01	S	2.956843E 02 2.954995E 02
4.200000E 01	\$ \$ \$ \$	2.953!32E 02
4.300000E 01 4.400000E 01	S S	2.951252E 02 2.949360E 02
4.500000E 01	Š	2.947454E 02

1

POINT-ID = 3

TIME	TYPE	VALUE
0.0	s	3.000000E 02
1.000000E 00	Š	3.000359E 02
2.000000E 00	S	3.001013E 02
3.000000E 00	S	3.001660E 02
	S	3.001000E 02
	S	3.002302E 02 3.002939E 02
	S	
6.000000E 00		
7.000000E 00	S	3.004192E 02
8.000000E 00	S	3.004807E 02
9.000000E 00	S	3.005413E 02
1.000000E 01	S	3.006008E 02
1.100000E 01	S	3.006594E 02
1.200000E 01	S	3.007170E 02
1.300000E 01	S	3.007737E 02
1.400000E 01	S	3.008293E 02
1.500000E 01	S	3.068838E 02
1.60000GE 01	S	3.009370E 02
1.700000E 01	S	3.009893E 02
1.800000E 01	S	3.010403E 02
1.90000CE 01	S	3.010901E 02
2.000000E 01	S	3.011387E 02
2.100000E 01	S	3.011860E 02
2.200000E 01	S	3.012319E 02
2.300000E 01	S	3.012766E 02
2.400000E 01	S	3.013198E 02
2.500000E 01	S	3.013618E 02
2.600000E 01	5	3.014023E 02
2.700000E 01	S	3.014414E 02
2.600000E 01	S	3.014792E 02
2.900000E 01	S	3.015156E 02
3.000000E 01	S	3.015505E 02
3.100000E 01	S	3.015842E 02
3.200000E 01	S	3.016165£ 02
3.300000E 01	S	3.016472E 02
3.400000E 01	S	3.016765E 02
3.500000E 01	S	3.017043E 02
3.600000E 01	S	3.017310E 02
3.700000E 01	S	3.017561E 02
3.600000E 01	Ş	3.017798E 02
3.900000E 01	S	3.0180205 02
4.0C0000E 01	S	3.018228E 02
4.100000E 01	S	3.018423E 02
4.200000E 01	S	3.018604E 02
4.300000E 01	S	3.018770E 02
4.400000E 01	Ş	3.018923E 02
4.500000E 01	S	3.019063E 02



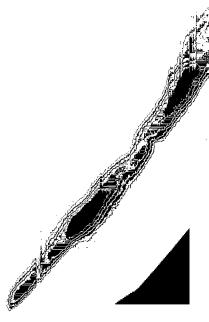
POINT-ID = 4

TIME	TYPE	VALUE
0.0		3.000000E 02
1.000000E 00	s s	3.000359£ 02
2.000000E 00	S	3.001016E 02
3.0000000 00	S	3.001672E 02
4.00000CE 00	S	3.002327E 02
5.000000E 00 6.000000E 00	S	3.002981E 02
6.000000E 00 7.000000E 00	\$ \$	3.003635£ 02 3.004290£ 02
8.000000E 00	S	3.004944E 02
9.000000E 00	Š	3.005596E 02
1.000000E 01	S	3.006248E 02
1.100000E 01	s s	3.006899E 02
1.20000E 01	S	3.007549E 02
1.300000E 01	S	3.008198E 02
1.400000E 01 1.500000E 01	5	3.008845E 02 3.009492E 02
1.600000E 01	3	3.009492E 02 3.010137E 02
1.700000E 01	S	3.010779E 02
1.800000E 01	555555555555555555555555555555555555555	3.011418E 02
1.900000E 01	S	3.012056E 02
2.000000E 01	S	3.012690E 02
2.100000E 01	S	3.013323E 02
2.200000E 01 2.30000GE 01	S S S	3.013953E 02 3.014580E 02
2.400000E 01	S	3.014580E 02 3.015205E 02
2.500000E 01	S	3.015825E 02
2.600000E 01	S	3.016440E 02
2.700000E 01	S	3.017056E 02
2.800000E 01	S	3.017666E 02
2.900000E 01	S	3.0182715 02
3.000000E 01	S	3.018875E 02
3.100000E 01 3.200000E 01	s s	3.019473E 02 3.020066E 02
3.300000E 01	S	3.020654E 02
3.400000E 01	S	3.021238E 02
3.500000E C1	S	3.021816E 02
3,609000E 01	S	3.022390E 02
3.700000E 01	S	3.022959E 02
3.800000E 01	s s	3.023523E 02
3.900000E 01 4.000000E 01	5	3.024082E 02 3.024634E 02
4.1000COE 01	s s s	3.025181E 02
4.200000E 01	Š	3.025723E 02
4.3000CUE 01	S	3.026257E 02
4.400000E 01	S	3.026787E 02
4.500000E 01	S	3.027310E 02

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POINT-ID = 5

TIME	TYPE	VALUE
0.0	s	3.000000E 02
1.000000E 00		2.992742E 02
2.000000E 00		2.979749E 02
3.000000E 00	S	2.967097E 02
4.000000E 00		2.954773E 02
5.000000E 00		2.942766E 02
6.000000E 00		2.931062E 02
7.000000E 00	5	2.919656E 02 2.908540E 02
8.000000E 00 9.000000E 00	3	2.908540E 02 2.897708E 02
1.000000E 01	s s s	2.867148E 02
1.1000GOE 01	Š	2.876851E 02
1.2000COE 01	s s s	2.866814E 02
1.300000E 01	S	2.857021E 02
1.400000E 01	S	2.847476E 02
1.500000E 01	S	2.838164E 02
1.600000E 01	S	2.829089E 02
1.70000CE 01	S	2.820234E 02
1.800000E.01	s s	2.811599E 02 2.803174E 02
2.000000E 01	S	2.794956E 02
2.100000E 01	š	2.766934E 02
2.200000E 01		2.779106E 02
2,300000E 01	S	2.771467E 02
2.400000E 01	S	2.764009E 02
2.500000E 01	S	2.756729E 02
2.600000E 01		2.749619E 02
2.7000COE 01 2.8000COE 01		2.742678E 02 2.735898E 02
2.900000E 01		2.729277E 02
3.000000E 01	š	2.722810E 02
3.100000E 01		2.716492E 02
3.200000E 01	S	2.710317E 02
3.300000E 01		2.704285E 02
3.400000E 01		2.698389E 02
3.500000E 01		2.692625E 02
3.600000E 01		2.636992E 02
3.700000E 01 3.800000E 01		2.681484E 02 2.676101E 02
3.900000E 01		2.670835E 02
4,000000E 01		2.665686E 02
4.100000E 01		2.660649E 02
4.200000E 01		2.655723E 02
4.300000E 01	s	2.650901E 02
4.400000E 01		2.646184E 02
4.500000E 01	s	2.641567E 02



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POINT-ID = E

TIME	TYPE	VALUE
0.C 1.000000E 00	S S	3.000000E 02 3.0001 07E 02
2.000000E 00 3.000000E 00	s s	3.000251E 02 3.000291E 02
4.000000E 00 5.000000E 00	S	3.000232E 02
6.000000E 00	'S	3.000076E 02 2.999827E 02
7.000000E 00 8.000000E 00	s s	2.999487E 02 2.999065E 02
9.000000E 00 1.000000E 01	S S	2.998557E 02
1.100000E 01	S	2.997969E 02 2.997302E 02
1.200000E 01 1.300000E 01	s s	2.996565E 02 2.995759E 02
1.400000E 01	s s	2.994685E 02 2.993943E 02
1.600000E 01	S	2.992942E 02
1.700000E 01 1.800000E 01	S S	2.991880E 02 2.990762E 02
1.900000E 01 2.000000E 01	S S	2.989587E 02 2.988359E 02
2.100000E 01	S	2.987080E 02
2.200000E 01 2.300000E 01	s s	2.985754E 02 2.984382E 02
2.400000E 01 2.500000E 01	s s	2.982966E 02 2.981506E 02
2.600000E 01	S	2.980007E 02
2.700000E 01 2.80000GE 01	S S	2.978472E 02 2.976899E 02
2.900000E 01 3.000000E 01	s s s	2.975288E 02 2.973645E 02
3.100000E 01 3.20000E 01	S S	2.971970£ 02
3.3C0000E 01	S	2.970266E 02 2.968533E 02
3.400000E 01 3.500000E 01	S S	2.966770E C2 2.964985E C2
3.600000E 01 3.70000E 01	S	2.963176E 02 2.961343E 02
3.800000E 01	999999999	2.959485E 02
3.900000E 01 4.000000E 01	S	2.957605E 02 2.955708E 02
4.100000E 01 4.20000E 01	s s s	2.953794E 02 2.951863E 02
4.3C0000E 01 4.400000E 01	S S	2.949912E 02
4.500000E 01	S	2.947947E 02 2.945967E 02

POINT-ID = 7

TIME		TYPE	VALUE	
D.0 1.000000E	00	5 S	3.000000E	02
2.000000E	00 00	5 5	3.000359E 3.001011E	02 02
3.000000E	00		3.001658E	02
4.000000E	00	s s s	3.002300E 3.002937E	02
6.0000COE	00	š	3.003567E	02
7.000000E	00	s s	3.004189E 3.004805E	02
9.000000E	co		3.005410E	02
1.000000E	01 01	5 5	3.005006E	02
1.2000008	01	555555	3.006594E 3.007170E	02
1.300000E	01	S	3.007737E	02
1.400000E	01 01	S S	3.008293E 3.008838E	02 02
1.600000E	01	5	3.009370E	02
1.700000E	01 01	\$ \$	3.009893E 3.010403E	02
1.900000E	01	S	3.010898E	02
2.000000E 2.100000E	01 01	s s	3.011382E 3.011853E	02 02
2.200000E	01	S	3.012310E	02
2.300000E 2.400000E	01 01	S	3.012754E	02
2.500000E	01	\$ \$ \$	3.013184E 3.013601E	02 02
2.600000E 2.700000E	01		3.014004E	02
2.800000E	01 01	s s	3.014392E 3.014768E	02 02
2.900000E	01	s s	3.015129E	02
3.000000E 3.100000E	01 01	\$ 5	3.015476E 3.015808E	02 02
3.200000E	01	Š	3.016123E	02
3.300000E 3.400000E	01 01	\$ \$ \$ \$	3.016433E 3.016724E	02 02
3.5000COE	01	S	3.016997E	02
3.600000E	01 01	s s	3.017258E 3.017505E	02 02
3.500000E	01	S	3.017737E	02
3.900000E 4.000000E	01	S	3.017954E	02
4.1C0000E	01	S	3.018157E 3.018345E	02
4.200000E	01	S	3.018521E	02
4.300000E 4.400000E	01 01	s s s s s		02 02
4.5000COE	01	S		02

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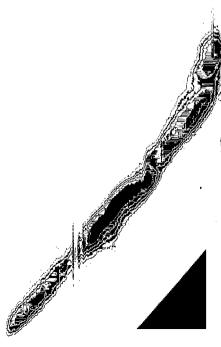
POINT-ID = 8

1.30J000E 01	1.30J00CCE 01 S 3.008213E 02 1.4000COE 01 S 3.008862E 02 1.5000COE 01 S 3.09509E 02 1.6000COE 01 S 3.010154E 02 1.700CGCE 01 S 3.010796E 02 1.600COE 01 S 3.011438E 02 1.90J00GCE 01 S 3.012078E 02	TIME 0.0 1.000000E 00 2.00000E 00 3.000000E 00 4.00000E 00 5.00000E 00 6.00000E 00 7.00000E 00 9.00000E 00 1.00000E 01 1.20000E 01	P S S S S S S S S S S S S S S S S S S S	VALUE 3.000000E 02 3.000361E 02 3.001018E 02 3.001675E 02 3.002988E 02 3.002988E 02 3.003645E 02 3.004999E 02 3.004954E 02 3.005608E 02 3.006250E 02 3.007563E 02
2 100000F 01 S 3 013347F 02	2.200000E 01	1.40000E 01 1.50000E 01 1.60000E 01 1.70000E 01 1.80000E 01 1.90000E 01 2.00000E 01	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	3.008862E 02 3.009509E 02 3.010154E 02 3.010796E 01 3.011438E 02 3.012078E 02 3.0127712E 02

POINT-ID =

NON-LINEAR TRANSIENT PROBLEM ... TRANSFER FUNCTION AND ARBITRARY NON-LINEAR LOADS

TIME	TYPE	VALUE
0.0	S	3.000000E 02
1.000000E 00 2.000000E 00	S S	2.992742E 02 2.979749E 02
3.000000E 00	S	2.967097E 02
4.000000E 00 5.000000E 00	S S	2.954773E 02 2.942766E 02
6.000000E 00	S	2.931062E 02
7.000000E 00	S	2.919656E 02
8.000000E 00 9.000000E 00	s s	2.908540E 02 2.897708E 02
1.000000E 01	S	2.897148E 02
1.100000E 01 1.200000E 01	s s	2.876851E 02 2.866814E 02
1.300000E 01	S	2.857021E 02
1.400000E 01	Ş	2.847476E 02
1.500000E 01 1.600000E 01	\$ 5	2.838164E 02 2.829089E 02
1.700000E 01	S	2.820234E 02
1.800000E 01 1.900000E 01	S S	2.811599E 02 2.803174E 02
2.000000E 01	S	2.794956E 02
2.100000E 01 2.200000E 01	S S	2.786934E 02 2.779106E 02
2.200000E 01 2.300000E 01	5 5	2.771467E 02
2.400000E 01	S	·2.764009E 02
2.500000E 01 2.600000E 01	s s	2.756729E 02 2.749619E 02
2.7000COE 01	S	2.742678E 02
2.800000E 01 2.900000E 01	S	2.735898E 02 2.729277E 02
3.000000E 01	s s	2.722810E 02
3.100000E 01 3.200000E 01	S S	2.716492E 02
3.200000E 01 3.300000E 01	S	2.710317E 02 2.704285E 02
3.4C0000E 01	S	2.698389E 02
3.500000E 01 3.60000E 01	s s s s	2.692625E 02 2.686992E 02
3.700000E 01	S	2.681484E 02
3.800000E 01 3.900000E 01	s s	2.676101E 02 2.670835E 02
4.000000E 01	S	2.665686E 02
4.100000E 01 4.200000E 01	s s	2.660649E 02 2.655723E 02
4.300000E 01	S	2.650901E 02
4.400000E 01 4.500000E 01	S S	2.646184E 02 2.641567E 02
4.500000E 01	3	2.641567E 02



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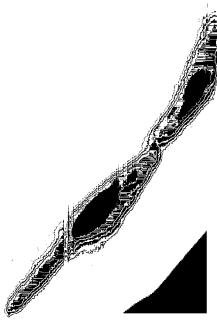
POINT-ID = 10

TIME	TYPE	VALUE
0.0	S	3.000000E 02
1.000000E 00	s s s s s s	2.992744E 02
2.000000E 00	S	2.979775E 02
3.000000E 00	S	2.967183E 02
4.0000002 00	S	2.954841E 02
5.003000E 00	S	2.943040E 02
6.000000E 00 7.000000E 00		2.931455E 02
8.0000000 00		2.920210E 02 2.909260E 02
9.0000000000000000000000000000000000000		2.898616E 02
1.000000E 01	Š	2.888259E 02
1.100000E 01	5 5 5 5 5	2.878184E 02
1.200000E 01	S	2,868384E 02
1.300000E 01	S	2.853845E 02
1.400000E 01	S	2.849565E 02
1.500000E 01	S	2.840535E 02
1.600000E 01	S	2.831743E 02
1.700000E 01 1.800000E 01	5	2.823193E 02
1.900000E 01	5	2.814871E 02 2.806763E 02
2.000000E 01	S	2.798875E 02
2.100000E 01	S	2.791194E 02
2.200000E 01	Š	2.783713E 02
2.300000E 01	S	2.776428E 02
2.400000E 01	S	2.769331E 02
2.500000E 01	S	2.762417E 02
2.6C000GE 01	S	2.755681E 02
2,.700000E 01	S	2.749116E 02
2.800000E 01 2.900000E 01	S	2.742720E 02
2.900000E 01 3.000000E 01	5	2.736484E 02 2.730405E 02
3.100000E 01	5	2.730405E 02 2.724480E 02
3.20000E 01	5	2.718701E 02
3.300000E 01	Š	2.713066E 02
3.40000GE 01	S	2.707571E 02
3.500000E 01	S	2.702212E 02
3.600000E 01	S	2.696982E 02
3.700000E 01	Ş	2.691882E 02
3.800000E 01	S	2.686904E 02
3.900000E 01 4.000000E 01	5	2.682046E 02
4.1000000E 01	5	2.677305E 02 2.672676E 02
4.2000COE 01	S	2.868157E 02
4.300000E 01	Š	2.663745E 02
4.40G000E 01	๛ ๛ ๛ ๛ ๛ ๛ ๛ ๛ ๛ ๛ ๛ ๛ ๛ ๛ ๛ ๛ ๛ ๛ ๛ 	2.659436E 02
4.500000E 01	s	2.655227E 02

POINT-ID = 100

TEMPERATURE VECTOR

TIME	1	TYPE	VALUE	
0.0		S	2.000000E	02
1.000000E	00	5	2.000055E	02
		5		
2.000000E	00	5	2.000062E	02
3.000000E	00	S S S	2.000056E	02
4.000000E	00	S	2.000060E	02
5.000000E	00	S	2.000056E	02
6.000000E	00	S	2.000052E	02
7.000000E	00	Š	2.000054E	02
8.000000E	00	s s	2.000052E	02
				02
9.000000E	00	s s s	2.000053E	
1.000000E	01	5	2.000052E	02
1.1000QOE	01	5	2.00C052E	02
1.200000E	01	S	2.000051E	02
1.300000E	01	S	2.000051E	02
1.4000COE	01	S	2.0C0C51E	02
1.5000G0E	01	S	2.000051E	02
1.600000E	01	Š	2.000050E	02
1.700000E	01	Š	2.000047E	02
1.80000CE	01	S	2.000047E	02
	-			
1.90000CE	01	s s	2.000046E	02
2.000000E	01	5	2.000046E	02
2.100000E	01	S	2.000046E	02
2 200000E	01	S	2.000045E	02
2.300000E	01	S	2.000045E	02
2.400000E	01	S	2.000044E	02
2.50000GE	01	S	2.000045E	02
2.600000E	01	\$	2.CC0044E	02
2.700000E	01	Š	2.000044E	02
2.800000E	01	S	2.000044E	02
	-	5		
2.900000E	01	S	2.000044E	02
3.000000E	01	S	2.000043E	02
3.100000E	01	S	2.000043E	02
3.2000COE	01	S	2.000040E	02
3.300000E	01	S	2.000042E	02
3.400000E	01	S	2.000037E	02
3.500000E	01		2.000041E	02
3.600000E	01	s s	2,000038E	02
3.700000E	01	Š	2.000040E	02
3.800000E	01	S S		02
	-	3	2.000038E	
3.900000E	01	S	2.0C0039E	02
4.000000E	01	S	2.000038E	02
4.100000E	01	S S	2.000039E	02
4.200000E	01	S	2.000038E	02
4.300000E	01	Ş	2.000038E	02
4.400000E	01	S	2.000038E	02
4.500000E	01	5	2.000038E	02



D. 100000 .

POINT-ID = 904

TIME	TYPE	VALUE
0.0 1.0000005 00	S S	3.000000E 02 -3.000359E 02
2.000GOGE 00	S	-3.000339E 02
3.000000E 00	S	-3.001672E 02
4.000000E 00 5.000000E 00	s s	-3.002327E 02 -3.002981E 02
6.000000E 00	S	-3.002901E 02
7.000000E 00	S	-3.004290E 02
8.000000E 00 9.000000E 00	\$ S	-3.004944E 02 -3.005596E 02
1.000000E 01	S	-3.006248E 02
1.100000E 01 1.2000C0E 01	S S	-3.006899E 02 -3.007549E 02
1.30000CE 01	S	-3.007549E 02 -3.008198E 02
1.400000E 01	S	-3.008845E 02
1.50000GE 01 1.60000GE 01	s s	-3.009492E 02 -3.010137E 02
1.700000E 01	S	-3.010779E 02
1.6000COE 01	S	-3.011418E 02
1.900000E 01 2.000000E 01	\$ \$ \$	-3.012056E 02 -3.012693E 02
2.100000E 01	s	-3.013323E 02
2.200000E 01	5	-3.013953E 02
2.300000E 01 2.400000E 01	s s	-3.014580E 02 -3.015205E 02
2.500000E 01	S	-3.015825E 02
2.600000E 01 2.700000E 01	s s	-3.016443E 02 -3.017053E 02
2.800000E 01	S	-3.017668E 02
2.90000CE 01	S	-3.018269E 02
3.000000E 01 3.100000E 01	s s	-3.018875E 02 -3.019473E 02
3.200000E 01	S	-3.020066E 02
3.3000C0E 01	S	-3.020654E 02
3.400000E 01 3.500000E 01	s s	-3.021238E 02 -3.021816E 02
3.600000E 01	S	-3.022390E 02
3.700000E 01 3.800000E 01	s s	-3.022959E 02 -3.023523E 02
3.900000E 01	\$	-3.024082E 02
4.000000E 01	S S	-3.024634E 02
4.100000E 01 4.200000E 01	S S	-3.025181E 02 -3.025723E 02
4.30000CE 01	S	-3.026257E 02
4.400000E 01	S S	-3.026787E 02
4.500000E 01	5	-3.027310E 02

```
NASTRAN LOADED AT LOCATION OFAF20
TIME TO GO = 299 CPU SEC., 298 I/O SEC.
    O CPU-SEC
                    O ELAPSED-SEC.
                                         BEGN
                                     SEM1
    O CPU-SEC.
                    O ELAPSED-SEC.
                                     SEMT
    o CPU-SEC.
                    2 FLARSED-SEC.
                                    NAST
     O CPU-SEC.
                    3 FLAPSED-SEC.
                                    GNEI
    O CPU-SEC.
                    3 ELAPSED-SEC.
                                    XCSA
                                    TEP1
    O CPU-SEC.
                    4 ELAPSED-SEC.
      CPU-SEC.
                    6 FLAPSED-SEC.
                                    XSOR
      CPU-SEC.
                   11 FLAPSED-SEC.
                                      DO
                                         IFP
    2 CPU-SEC.
                   24 ELAPSED-SEC.
                                     FND
                                          TEP
    2 CPU-SEC.
                   24 FLAPSED-SEC.
                                     XGPI
    4 CPU-SEC
                   30 ELAPSED-SEC.
                                     SEM1
                                          END
    4 CPU-SEC.
                   30 ELAPSED-SEC.
                                          LINKNSC2 ---
    24 I/O SEC.
LAST LINK DID NOT USE
                     40016 BYTES OF OPEN CORE
     4 CPU-SEC.
                   32 E! APSED-SEC.
                                          LINK END ---
     4 CPU-SEC.
                   32 ELAPSED-SEC.
                                     XSFA
     4 CPU·SEC.
                                    XSFA
                   33 FLAPSED-SEC.
                                     3
     4 CPU-SEC.
                   33 FLAPSED-SEC.
                                          GP<sub>1</sub>
                                                 BEGN
     4 CPU-SEC.
                   37 ELAPSED-SEC.
                                     3
                                          GP 1
                                                 FND
     4 CPU-SEC.
                   39 ELAPSED-SEC.
                                     Я
                                          GP2
                                                 BEGN
     4 CPU-SEC.
                                     8
                                          GP2
                                                 END
                   40 ELAPSED-SEC.
                                                 BEGN
     4 CPU-SEC.
                   40 FLAPSED-SEC.
                                     10
                                          PLISET
     4 CPU-SEC.
                   41 ELAPSED-SEC.
                                          PLISET
                                                 FND
                                     10
     4 CPU-SEC.
                   41 ELAPSED-SEC.
                                     12
                                          PRIMSG
                                                 BEGN
                                          PRTMSG
     4 CPU-SEC.
                   42 ELAPSED-SEC.
                                     12
                                                 END
     4 CPU-SEC.
                   42 ELAPSED-SEC.
                                     13
                                          SETVAL
                                                 BEGN
     4 CPU-SEC.
                   42 FLAPSED-SEC.
                                     13
                                          SFTVAL
                                                 END
     4 CPU-SEC.
                                     21
                                                 REGN
                   43 ELAPSED-SEC.
                                          GP3
     4 CPU-SEC.
                                     21
                                          GP3
                                                 FND
                   51 ELAPSED-SEC.
                                     23
                                                 BEGN
     4 CPU-SEC.
                   51 ELAPSED-SEC.
                                          ΤΔ1
     4 CPU-SEC.
                   59 ELAPSED-SEC.
                                     23
                                          TA1
                                                 END
     4 CPU-SEC.
                   60 ELAPSED-SEC.
                                          LINKNSO3 ---
    56 I/O SEC.
LAST LINK DID NOT USE
                     82788 BYTES OF OPEN CORE
                   63 ELAPSED-SEC.
     5 CPU-SEC.
                                          LINK END ---
                                     27
                                                 BEGN
     5 CPU-SEC.
                   63 ELAPSED-SEC.
                                          SMA1
    5 CPU-SEC.
                   36 ELAPSED-SEC.
                                     27
                                          SMA1
                                                 END
                                          SMA2
    5 CPU-SEC.
                   57 ELAPSED-SEC.
                                     30
                                                 BEGN
    5 CPU-SEC.
                   70 ELAPSED-SEC.
                                     30
                                          SMA2
                                                 END
                                          LINKNSO5 ---
    5 · CPU · SEC .
                   71 ELAPSED-SEC.
    64 I/C SEC.
LAST LINK DID NOT USE
                     64268 BYTES OF
                                  OPEN CORE
     5 CPU-SEC.
                   74 ELAPSED-SEC.
                                     . . . .
                                          LINK END ---
     5 CPU-SEC.
                                     35
                                          RMG
                                                 BEGN
                   74 ELAPSED-SEC.
                                     35
                                                 END
     5 CPU-SEC.
                   74 ELAPSED-SEC.
                                          RMG
     5 CPU-SEC.
                   75 ELAPSED-SEC.
                                     XSFA
     5 CPU-SEC.
                   76 ELAPSED-SEC.
                                     XSFA
     5 CPU-SEC.
                   76 ELAPSED-SEC.
                                          LINKNSO4 ---
    68 I/O SEC.
LAST LINK DID NOT USE
                     8698C BYTES OF OPEN CORE
     5 CPU-SEC.
                   78 ELAPSED-SEC.
                                          LINK END ---
     5 CPU-SEC.
                                     40
                                          GP4
                                                 BEGN
                   78 ELAPSED-SEC.
     5 CPU-SEC.
                   81 ELAPSED-SEC.
                                     40
                                          GP4
                                                 END
     5 CPU-SEC.
                   82 ELAPSED-SEC.
                                     46
                                          GPSP
                                                 BEGN
```

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5 CPU-SEC.
                       83 ELAPSED-SEC.
                                                 GPSP
                                                          END
                                           46
                                           ---- LINKNS14 ---
     5 CPU-SEC.
                       83 ELAPSED-SEC.
    75 I/O SEC.
LAST LINK DID NOT USE 117044 BYTES OF OPEN CORE
                      65 ELAPSED-SEC.
     S CPU-SEC.
                                           ---- LINK END ---
     6 CPU-SEC.
                       85 ELAPSED-SEC.
                                           47
                                                 OFP
                                                          BEGN
     6 CPU-SEC.
                       E6 ELAPSED-SEC.
                                           47
                                                 OFP
                                                          END
                                                 LINKNSO4 ---
                       E7 ELAPSED-SEC.
     6 CPU-SEC.
                                           ----
    73 I/O SEC.
LAST LINK DID NOT USE 115664 SYTES OF OPEN CORE
     3 CPU-SEC.
                       £9 ELAPSED-SEC.
                                           ---- LINK END ---
     6 CPU-SEC.
                       E9 ELAPSED-SEC.
                                           51
                                                 MCE1
                                                          BEGN
     6 CPU-SEC.
                       91 ELAPSED-SEC.
                                           51
                                                 MCE1
                                                          END
     6 CPU-SEC.
                       91 ELAPSED-SEC.
                                           53
                                                  MCE2
                                                          BEGN
     6 CPU-SEC.
                       93 ELAPSED-SEC.
                                           APYA
                                                 D
                                                                            1.EST. TIME =
                                                                                                  0.0
                                                  METHOD 2 NT.NBR PASSES =
     3 CPU-SEC.
                       95 ELAPSED-SEC.
                                           MPYA
                                                 D
                                           MPYA
     6 CPU-SEC.
                       96 ELAPSED-SEC.
                                                                                                  0.0
                                                  METHOD 2 T .NBR PASSES =
                                                                             1.EST. TIME =
     6 CPU-SEC.
                       97 ELAPSED-SEC.
                                            MPYA
                                                 D
     6 CPU-SEC.
                       98 ELAPSED-SEC.
                                            MPYA
                                                                                                  0.0
                                                  METHOD 2 T .NBR PASSES =
                                                                              1.EST. TIME =
     7 CPU-SEC.
                                            MPYA D
                      100 ELAPSED-SEC.
                                            MPYA
     7 CPU-SEC.
                      103 ELAPSED-SEC.
                                                  METHOD 2 NT, NBR PASSES =
                                                                              1.EST. TIME =
                                                                                                  0.0
     7 CPU-SEC.
                      104 ELAPSED-SEC.
                                            MPYA D
     7 CPU-SEC.
                      105 ELAPSED-SEC.
                                            MPYA
                                                  METHOD 2 T .NBR PASSES =
                                                                              1.EST. TIME =
                                                                                                  0.0
                                            MPYA D
     7 CPU-SEC.
                      106 ELAPSED-SEC.
                                            MPYA
     8 CPU-SEC.
                      106 ELAPSED-SEC.
                                                 D
                                                  METHOD 2 T ,NBR PASSES =
                                                                                                  0.0
                                                                             1.EST. TIME =
     B CPU-SEC.
                      108 ELAPSED-SEC.
                                            MPYA D
     8 CPU-SEC.
                      108 ELAFSED-SEC.
                                            53
                                                  MCE2
                                                          END
                      1'2 ELAPSED-SEC.
                                            XSFA
     8 CPU-SEC.
     8 CPU-SEC.
                      1.2 ELAPSED-SEC.
                                            XSFA
     8 CPU-SEC.
                      113 ELAPSED-SEC.
                                            - - - -
                                                  LINKNSO6 ---
    95 I/O SEC.
LAST LINK DID NOT USE 109332 BYTES OF OPEN CORE
                                            ---- LINK END ---
     8 CPU-SEC.
                      115 ELAPSED-SEC.
                      115 ELAPSED-SEC.
                                            75
                                                  DPD
                                                          BEGN
     B CPU-SEC.
                                                  DPD
                                            75
                                                          END
     B CPU-SEC.
                      123 ELAPSED-SEC.
     8 CPU-SEC.
                      125 ELAPSED-SEC.
                                                  LINKNS10 ---
   106 I/O SEC.
LAST LINK DID NOT USE 116416 BYTES OF OPEN CORE
                      128 ELAPSED-SEC.
                                            ---- LINK END ---
     9 CPU-SEC.
                                            51
                                                  MTRXIN BEGN
      9 CPU-SEC.
                      128 ELAPSED-SEC.
     9 CPU-SEC.
                      130 ELAPSED-SEC.
                                            81
                                                  MTRXIN
                                                          END
     9 CPU-SEC.
                      130 ELAPSED-SEC.
                                            83
                                                  PARAM
                                                          BEGN
     9 CPU-SEC.
                      131 ELAPSED-SEC.
                                            83
                                                  PARAM
                                                          END
      9 CPU-SEC.
                                            88
                                                          BEGN
                      132 ELAPSED-SEC.
                                                  GKAD
      9 CPU-SEC.
                      135 ELAPSED-SEC.
                                            MPYA
                                                  D
                                                  METHOD 2 NT.NBR PASSES =
                                                                            1,EST, TIME =
                                                                                                  0.0
      9 CPU-SEC.
                      136 ELAPSED-SEC.
                                            MPYA
      9 CPU-SEC.
                      137 ELAPSED-SEC.
                                            MPYA
                                                                                                  0.0
                                                  METHOD 2 NT, NBR PASSES =
                                                                              1.EST. TIME -
                                            MPYA
      9 CPU-SEC.
                      138 ELAPSED-SEC.
                                                  D
      9 CPU-SEC.
                      139 ELAPSED-SEC.
                                            MPYA
                                                  METHOD 2 T ,NBR PASSES = 1.EST. TIME =
                                                                                                  0.0
     10 CPU-SEC.
                      140 ELAPSED-SEC.
                                            MPYA
                                                 D
     10 CPU-SEC.
                      144 ELAPSED-SEC.
                                            88
                                                  GKAD
                                                          END
                                            XSFA
     10 CPU-SEC.
                      144 ELAPSED-SEC.
     10 CPU-SEC.
                      145 ELAPSED-SEC.
                                            XSFA
     10 CPU-SEC.
                                            ---- LINKNSO5 ---
                      145 ELAPSED-SEC.
    119 I/O SEC.
```

```
LAST LINK DID NOT USE 102660 BYTES OF OPEN CORE
    10 CPU-SEC.
                     147 ELAPSED-SEC.
                                           ---- LINK END ---
                                                 TRLG
                                                          BEGN
    10 CPU-SEC.
                     147 ELAPSED-SEC.
    10 CPU-SEC.
                     154 ELAPSED-SEC.
                                           MPYA
                                                 D
                                                                                                 0.0
                                                 METHOD 2 T .NBR PASSES =
                                                                             1.EST. TIME =
    10 CPU-SEC.
                     155 ELAPSED-SEC.
                                           MPYA
    10 CPU-SEC.
                     157 ELAPSED-SEC.
                                           MPYA
                                                 Ð
                                                                             1.EST. TIME =
                                                                                                 0.0
                                                 METHOD 2 NT.NBR PASSES =
    11 CPU-SEC.
                     158 ELAPSED-SEC.
                                           MPYA
                     158 ELAPSED-SEC.
                                           MPYA
    11 CPU-SEC.
                                                 METHOD 2 NT.NBR PASSES =
                                                                              1.EST. TIME =
                                                                                                 0.0
                     159 ELAPSED-SEC.
                                           MPYA
                                                 D
    11 CPU-SEC.
                                           MPYA D
    11 CPU-SEC.
                     160 ELAPSED-SEC.
                                                 METHOD 2 NT.NBR PASSES =
                                                                             1,EST, TIME =
                                                                                                 0.0
                                           MPYA
    11 CPU-SEC.
                     161 ELAPSED-SEC.
                                                 D
                                                          END
                     161 ELAPSED-SEC.
                                           92
                                                 TRLG
    11 CPU-SEC.
    11 CPU-SEC.
                     162 ELAPSED-SEC.
                                           XSFA
    11 CPU-SEC.
                     162 ELAPSED-SEC.
                                           XSFA
                                                 LINKNS11 ---
    11 CPU-SEC.
                     162 ELAPSED-SEC.
   133 I/O SEC.
LAST LINK DID NOT USE 58196 BYTES OF OPEN CORE
                     164 ELAPSED-SEC.
                                           ---- LINK END ---
    11 CPU-SEC.
                                                 TRHT
                                                          BEGN
                     164 ELAPSED-SEC.
                                           97
    11 CPU-SEC.
                                           DECO MP
                     166 ELAPSED-SEC.
    11 CPU-SEC.
                                                 MP
    11 CPU-SEC.
                     167 ELAFSED-SEC.
                                           DECO
    13 CPU-SEC.
                     198 ELAPSED-SEC.
                                           97
                                                 TRHT
                                                          END
                     199 ELAPSED-SEC.
                                                 LINKNS12 ---
    13 CPU-SEC.
   181 I/O SEC.
LAST LINK DID NOT USE 61768 BYTES OF OPEN CORE
                                                 LINK END ---
    13 CPU-SEC.
                     202 ELAPSED-SEC.
                                           ----
    13 CPU-SEC.
                     202 ELAPSED-SEC.
                                           99
                                                 VDR
                                                          BEGN
                     205 ELAPSED-SEC.
                                           99
                                                  VDR
                                                          END
    13 CPU-SEC.
                     206 ELAPSED-SEC.
                                                 LINKNS14 ---
    13 CPU-SEC.
                                           ----
   187 I/C SEC.
LAST LINK DID NOT USE 119112 BYTES OF OPEN CORE
                     209 ELAPSED-SEC.
                                           ---- LINK END ---
    13 CPU-SEC.
    13 CPU-SEC.
                     209 ELAPSED-SEC.
                                           103
                                                 SDR3
                                                          BEGN
                                                          END
                                                 SDR3
    13 CPU-SEC.
                     212 ELAPSED-SEC.
                                           103
    13 CPU-SEC.
                     212 ELAPSED-SEC.
                                           104
                                                 OFP
                                                          BEGN
                                                 OFP
                                                          END
    13 CPU-SEC.
                     213 ELAPSED-SEC.
                                           104
                                                 PARAM
                                                          BEGN
    13 CPU-SEC.
                     214 ELAPSED-SEC.
                                           111
    13 CPU-SEC.
                      214 ELAPSED-SEC.
                                           111
                                                  PARAM
                                                          END
    13 CPU-SEC.
                      214 ELAPSED-SEC.
                                                 LINKNS12 ---
   194 I/C SEC.
LAST LINK DID NOT USE 44048 BYTES OF OPEN CORE
                                           ---- LINK END ---
    13 CPU-SEC.
                      218 ELAPSED-SEC.
                                           115 SDR1
                                                          BEGN
    13 CPU-SEC.
                      218 ELAPSED-SEC.
    13 CPU-SEC.
                     218 ELAPSED-SEC.
                                           MPYA D
                                                                            1.EST. TIME =
                                                                                                 0.1
                                                  METHOD 2 NT, NBR PASSES =
                                           MPYA
    14 CPU-SEC.
                      2'9 ELAPSED-SEC.
                                                 Ð
    14 CPU-SEC.
                      223 ELAPSED-SEC.
                                           115
                                                 SDR1
                                                          END
                      223 ELAPSED-SEC.
                                                  LINKNSOB ---
    14 CPU-SEC.
   203 I/O SEC.
LAST LINK DID NOT USE 125752 BYTES OF OPEN CORE
    14 CPU-SEC.
                      229 ELAPSED-SEC.
                                           ---- LINK END ---
                                           118
                                                 PLTTRAN BEGN
    14 CPU-SEC.
                      229 ELAPSED-SEC.
                                                 PLTTRAN END
    14 CPU-SEC.
                      230 ELAPSED-SEC.
                                           118
                                                 LINKNS13 ---
    14 CPU-SEC.
                      230 ELAFSED-SEC.
   208 I/O SEC.
LAST LINK DID NOT USE 114512 BYTES OF OPEN CORE
                                                 LINK END ---
                      235 ELAPSED-SEC.
                                           ----
    14 CPU-SEC.
                                                 SDR2
                                                          BEGN
                                           120
    14 CPU-SEC.
                      235 ELAPSED-SEC.
    14 CPU-SEC.
                      238 ELAPSED-SEC.
                                           120
                                                 SDR2
                                                          END
                                           ---- LINKNS14 ---
    14 CPU-SEC.
                      238 ELAFSED-SEC.
```

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MASA-Fandies , 1577
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```
= 217 I/O SEC.
LAST LINK DID NOT USE 66:28 SYTES OF OPEN CORE
                                          ---- LINK END ---
    15 CPU-SEC.
                     245 ELAPSED-SEC.
    15 CPU-SEC.
                     245 ELAPSED-SEC.
                                          121
                                               SDR3
                                                       BEGN
    15 CPU-SEC.
                     249 ELAPSED-SEC.
                                          121
                                               SDR3
                                                       ΕND
    15 CPU-SEC.
                     249 ELAPSED-SEC.
                                          123
                                               CFP
                                                       BEGN
    15 CPU-SEC.
                     253 ELAPSED-SEC.
                                          123
                                               OFP
                                                        END
    15 CPU-SEC.
                     253 ELAPSED-SEC.
                                          130
                                               XYTRAN BEGN
    15 CPU-SEC.
                     153 ELAPSED-SEC.
                                          130 XYTRAN END
    15 CPU-SEC.
                     253 ELAPSED-SEC.
                                          ---- LINKNS02 ---
   230 I/O SEC.
LAST LINK DID NOT USE
                         8132 BYTES OF OPEN CORE
    16 CPU-SEC.
                     262 ELAPSED-SEC.
                                          ---- LINK END ---
    13 CPU-SEC.
                     262 ELAPSED-SEC.
                                          132 XYPLOT BEGN
    16 CPU-SEC.
                     263 ELAPSED-SEC.
                                               XYPLOT END
                                          132
    13 CPU-SEC.
                     263 ELAPSED-SEC.
                                          138
                                               EXIT
                                                        BEGN
= 231 I/O SEC.
LAST LINK DID NOT USE 97232 BYTES OF OPEN CORE
```

AMOUNT OF OPEN CORE NOT USED = 7K BYTES

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